COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXIX SEPTEMBER 1950

MARTIN (J. P.). **Use of acid, rose bengal, and streptomycin in the plate method for estimating soil fungi.**—*Soil Sci.*, 69, 3, pp. 215–232, 1 fig., 1950.

At the Citrus Experiment Station, Riverside, California, a study was made of the comparative use, singly and in various combinations, of sulphuric acid, rose bengal [*R.A.M.*, 24, p. 204; 29, p. 199], and streptomycin as bacterial growth inhibitors in various nutrient media for the determination of numbers and types of soil fungi by the dilution plate method [cf. ibid., 29, p. 432].

At a concentration of 1 in 15,000 rose bengal in glucose-nitrate-soil extract agar prevented the growth of most bacteria from some soils. A combination of the dye at the same strength or 1 in 30,000 with 30γ per ml. streptomycin on the same medium, peptone-dextrose agar, and peptone-dextrose-oxgall agar, and a combination of 1 in 100,000 crystal violet and 30γ per cent. streptomycin on the last-named substratum virtually eliminated bacterial growth from all the soils tested. Streptomycin alone exerted a slightly fungistatic effect on only two out of 117 cultures of fungi, while rose bengal slightly retarded the spreading of *Cunninghamella bertholletiae* and very markedly reduced the growth rate of *Trichoderma lignorum* [*T. viride*] and *Rhizopus nigricans* [*R. stolonifer*].

On the basis of facility of identification, size of the few bacterial colonies that occasionally developed, numbers and kinds of fungi, and fungal colony dimensions, peptone dextrose agar containing 1 in 30,000 rose bengal and 30γ per ml. streptomycin was rated the best medium for soil fungus plating. By the use of this substratum the numbers of fungi found in the soil were increased by up to 100 per cent. and the types isolated from a relatively large proportion of samples by approximately 14 per cent., in comparison with the values obtained on the same basic medium acidified to pH 4 with sulphuric acid. Most of the increase in numbers resulted from the growth of types of fungi which failed to develop on the acid medium, while part was due to a reduction in the diffusion and size of many fungal colonies. Six species consistently isolated in relatively large numbers on the new medium, including *Stysanus stemonites* [ibid., 26, p. 270] and *Fusarium* sp. 6, seldom or never developed on the acidified agar.

GASSNER (G.). **Der Einfluss der Standweite auf den Befall des Mohns durch Helminthosporium papaveris Hennig.** [The influence of planting width on the infection of Poppy by *Helminthosporium papaveris* Hennig.]—*NachrBl. dtsch. PflSchDienst.* (*Braunschw.*), 1, 9, pp. 119–123, 2 figs., 1949.

Reinmuth's investigations in Germany on the opium poppy disease caused by *Helminthosporium papaveris* [*Pleospora calvescens*: *R.A.M.*, 27, pp. 123, 124] were concerned only with the leaf blight phase, but the fungus is also responsible for 'abstriction' of the seedlings, generalized infection resulting in the death of the plants before flowering, and the invasion of the capsules, of primary importance in the spread of the pathogen. Some of the diseased capsules are normal in size and show no external symptoms, but the seeds within them adhere to the pericarp, and in cases of severe infection may be matted together by the

mycelium. Other infected capsules are easily recognizable by a dark discoloration or the presence of conidia on the exterior, or they may be undersized and stunted on one side. The entry of the fungus into the capsules may be effected, as shown by Ballarin (*Phytopath. Z.*, in the press) and Maria E. Meffert (Thesis, Berlin, 1949), either through the stigma or, as demonstrated by the author, from any point on the capsule wall.

The starting point of Ballarin's studies on *P. calvescens* at the Biological Institute, Brunswick, was the observation in 1946 that plants in the two outermost rows of a large plot were more severely attacked than those in the inner ones. Thus, in the former the percentages of healthy plants, of those with a trace, mild to moderate, and severe infection were 10·8, 18·3, 45·7, and 25·7, respectively, compared with 54·7, 20·7, 17·4, and 7·2 in the latter. Since these divergences were evidently related to differences in development, experiments were carried out in 1947 in which the spacing was varied by the use of 12, 22, and 50 plants per sq. m. Notwithstanding the abnormally dry summer, the closely spaced plants flowered eight to ten days earlier than those set further apart. The number of capsules per plant ranged from 1·08 for the closest spacing to 1·27 and 1·44 for the medium and wide, respectively. The percentages of capsules harvested (from the inner rows only) were, for the narrow spacing, 63·7 healthy and 6·7 severely infected, the rest intermediate; medium, 25·1 and 10·8; and wide, 20·8 and 16·5.

A new series of experiments was designed by the author in 1948 to ascertain the combined influence of different sowing dates and planting widths on capsule infection by *P. calvescens*. In the earlier sowings (31st March), the percentages of healthy and heavily infected capsules in the inner rows of the plots (average of three) with 50 plants per sq. m. were 45·2 and 2·6, respectively, the rest intermediate; 22·2 plants, 18·6 and 12·8; 12·5 plants, 7·8 and 26·7; and 6·25 plants, 2 and 44·3; and for the outer rows, 50 plants, 15·5 and 16·2; 22·2 plants, 7·9 and 27·4; 12·5 plants 4·1 and 33·4; and 6·25 plants 2, and 42·1. The corresponding figures in the late-sown (19th April) plots were as follows: for the inner rows, 50 plants per sq. m., 49·7 per cent. healthy and 6·1 per cent. heavily infected; 22·2 plants, 30·6 and 12; 12·5 plants, 15·9 and 16·9; and 6·25 plants, 7·9 and 29·7; and for the outer, 50 plants, 13·2 healthy and 10·6 severely infected; 22·2 plants, 10·6 and 14·8; 12·5 plants, 5·1 and 20·8; and 6·25 plants, 5·3 and 22·7. The average seed weights of the heavily infected and of all capsules were compared, with the following results: 50 plants per sq. m., 1·06 and 2·33, respectively; 22·2 plants, 1·34 and 3·02; 12·5 plants, 1·38 and 3·19; and 6·25 plants, 1·37 and 2·84. The numbers of capsules, total weight of seeds, and the seed weights per capsule in relation to the degree of infection were estimated as follows: healthy, 160 capsules, total seed weight 531 gm., 3·32 gm. seeds per capsule; trace of infection, 818, 2,893, and 3·54; slight to moderate infection, 439, 1,465, and 3·34; and severe, 598, 819, and 1·37.

The exact statistical evaluation of the yield reductions due to *P. calvescens* is a very complicated problem. Ballarin concludes from a comparison of his observations with the yield data of earlier planting width experiments (*Fortschr. Landw.*, 2, pp. 539–541, 1928) that the loss would approach 40 per cent., to which must be added a more or less substantial reduction in the oil content of the seeds from heavily infected capsules. Planting width is evidently an important factor, in some soils at any rate, in the development of *P. calvescens*, which may be impeded by reasonably narrow spacing to ensure rapid and uniform growth of the crop.

Chu (H. T.) & Wang (S. C.). **Effect of several fungicides on the pathogens of some important diseases of Sugar Cane (I).**—*Rep. Taiwan Sug. Exp. Sta.*, 4, pp. 202–209, 1949. [Chinese, with English summary.]

In comparative tests carried out at the Taiwan Sugar Experiment Station, Formosa, sugar-cane seed piece treatments [cf. *R.A.M.*, 29, p. 172] with 0·1 per

cent. ceresan for two minutes and 0·1 per cent. granosan for ten minutes were as effective as 0·1 per cent. mercuric chloride for the control of *Ceratostomella paradoxa* [ibid., 28, p. 142], *Colletotrichum falcatum* [*Physalospora tucumanensis*], *Cytospora sacchari* [ibid., 17, p. 840], *Fusarium moniliforme* [*Gibberella fujikuroi*], and *Cercospora vaginae* [ibid., 26, p. 126] on the variety P.O.J. 2883. The results of pot experiments demonstrated that the germination and early development of seed pieces inoculated with *C. paradoxa* or planted in inoculated soil were better after treatment with 0·2 per cent. granosan for five minutes or 0·1 per cent. ceresan for two minutes than with 0·1 per cent. mercuric chloride for two minutes. The effect was especially conspicuous after soil inoculation. Granosan was somewhat superior, possibly owing to the higher concentration and longer treatment.

Chu (H. T.). **Studies on the dead stalks of Cane crop. (The first report.)**—*Rep. Taiwan Sug. Exp. Sta.*, 3, pp. 205–226, 5 graphs, 1948. [Chinese, with English summary. Received March, 1950.]

Investigations in Formosa from 1946 to 1948 of the growth of 1,200 seed pieces each of the sugar-cane varieties F. 108, P.O.J. 2883, P.O.J. 2725, and P.O.J. 2878 [see next abstract] showed that 77·29 per cent. of the total deaths occurred between June and November. The total percentage of dead stalks in terms of the maximum number of tillers was 47·26 per cent. Fungal diseases were responsible for 34·94 per cent. of the total dead stalks of which *Cytospora sacchari* [see preceding abstract] constituted 13·25 per cent. 'Pokkah boeng' [*Gibberella fujikuroi*: C.M.I. Map No. 102] and red rot [*Physalospora tucumanensis*: *R.A.M.*, 27, p. 256] comprised only a small percentage. P.O.J. 2725 was the most resistant to *C. sacchari* (2·55 per cent. infection) followed by P.O.J. 2878 (5·12), F. 108 (7·84), and P.O.J. 2883 (11·03). An unknown rot at the growing point of the shoot also caused the death of many stalks. Isolations yielded a bacterium, but further studies are necessary to confirm whether it is the causal organism.

Chu (H. T.) & Tsai (T. K.).—**Studies on the dead stalks of Cane crop. (The second report.)**—*Rep. Taiwan Sug. Exp. Sta.*, 4, pp. 183–201, 1949. [Chinese, with English summary.]

In further investigations into the occurrence of dead stalks in sugar cane crops [see preceding abstracts] during 1947 to 1948 using the same varieties, it was found that most dead stalks in autumn-planted canes occurred between May and August, mainly owing to insect injury and red rot of the leaf sheath [*Sclerotium rolfsii*: ibid., 28, p. 641] mostly in F. 108, and in October and November, caused by insects and red rot [*Physalospora tucumanensis*] mainly in P.O.J. 2725. The total number of dead stalks was 53·7 per cent. In spring-planted canes (total death rate 36·8 per cent.) stalk death rate was highest in June and July (insect attack), and from September to November when it was due to red rot of the leaf sheath, *Cytospora sacchari* (in P.O.J. 2883), red rot (in P.O.J. 2725), and borer infestation. In ratoon crops (total death rate 72·3 per cent.) the highest percentage occurred from May to August. Insect injury and *C. sacchari* (in P.O.J. 2883) were again the main causes. In December red rot was prominent. The percentages with fungal disease infestation were 20·2, 10·8, and 4·2 for autumn, spring, and ratoon canes, respectively. P.O.J. 2878 was the most resistant to both insect and fungal attacks.

Moreau (C.) & Moreau (Mireille). **Quelques Ascomycètes du Congo recueillis par MM. Roger Heim et A. Bachy.** [Some Ascomycetes from the Congo collected by MM. Roger Heim and A. Bachy.]—*Rev. Mycologie, Suppl. colon.*, 14, 2, pp. 50–66, 5 figs., 1949.

This annotated list of Ascomycetes from the French Congo includes *Parodiella*

circumdata [cf. *R.A.M.*, 3, p. 238], found on oil palm fronds. In the author's opinion *P. gloeosporidia* [ibid., 28, p. 31], found on oil palm in the Belgian Congo, is a synonym of *P. circumdata*. *Coniochaeta elaeicola* (Hennings) n. comb., also isolated from oil palm, is the fungus described by Hennings as *Rosellinia elaeicola*. *Phaeophragmeriella ugandensis* Hansford var. *etoumbii* n.var. was parasitic on *Meliola elaeis* on oil palm fronds.

Teixeira (A. R.). **Himenomicetos brasileiros—IV. Polyporaceae—1.** [Brazilian Hymenomycetes—IV. Polyporaceae—1.]—*Bragantia, S. Paulo*, 8, 1–12, pp. 75–80, 5 pl., 1948. [Received May, 1950.]

Of the three species comprised in this further instalment of the author's critically annotated list of Brazilian Hymenomycetes [*R.A.M.*, 26, p. 81], *Poria medullapanis* [ibid., 22, p. 117] was found on rotten trunks of *Acer*, *Artemisia*, *Castanea*, *Ostrya*, poplar, *Prunus*, oak, *Rhus*, *Robinia*, lime (*Tilia*), and elm.

Kuhner (R.). **Absence de boucles chez les Basidiomycètes de la série des Igniaires et comportement nucléaire dans le mycélium des Hymenochaete Lév.** [Absence of clamp-connexions in the Basidiomycetes of the *igniarius* series and nuclear behaviour in the mycelium of species of *Hymenochaete* Lév.]—*C.R. Acad. Sci., Paris*, 230, 18, pp. 1606–1608, 1950.

Studies on the mycelium of over 30 species of the [? *Fomes*] *igniarius* series of Basidiomycetes revealed a general absence of clamp-connexions [*R.A.M.*, 28, p. 201], a character which is regarded as of high diagnostic importance.

Petrak (F.). **Über Placostromella n.gen. und die Gattung Placostroma Theiss. et Syd.** [On *Placostromella* n.g. and the genus *Placostroma* Theiss. & Syd.]—*Sydowia*, 1, 1–3, pp. 9–11, 1947.

Descriptions are given of *Placostromella* n.g. and its type species *P. macrospora* n.sp., collected on living foliage of *Castanopsis ceratacantha* in Kweichow, China. It is distinguished from *Placostroma* by the number of loculi in the stroma, the type of fruit body, and spore size. The latter genus is considered to be mixed, its type species, *P. pterocarpi* (Mass.) Theiss. & Syd., being identical with *Phyllachora pterocarpi* and the remaining six species belonging to three or possibly four different genera.

De Jong (P.). **'Defoliation': a disorder of Tea in S. India.**—*Plant. Chron.*, 45, 6, pp. 155–158, 1950.

Investigations at the Tea Experiment Station, Devarshola, have shown that the new decline disease of tea, 'defoliation', first reported on a large scale in 1947 from southern India [*R.A.M.*, 29, p. 57], does not appear to be accompanied by any anatomical peculiarities that might suggest a virus disease. In a manurial plot experiment there was a significant correlation between the intensity of defoliation and the potassium levels; the leaves of healthy bushes had a higher potassium content and lower carbohydrate than affected ones. There is a possibility that drought also may be involved and experiments are in progress to test these two possibilities.

Miller (P. R.) & O'Brien (Muriel). **January temperatures in relation to the distribution and severity of downy mildew of Tobacco. II. A review of the past nineteen years.**—*Plant Dis. Reptr*, 33, 11, pp. 418–425, 10 graphs, 1949. [Mimeographed.]

Reviewing the occurrence of tobacco blue mould (*Peronospora tabacina*) [*R.A.M.*, 29, p. 292 and next abstract] in the United States in relation to January tempera-

tures [ibid., 17, p. 76] the authors conclude from a summary of all the collaborator reports that infection was severe in 1932, 1933, 1937, 1947, and 1949 when January temperatures were above normal. Not all the factors involved in this apparently close relationship are known, but it is assumed that above-normal January temperatures stimulate oospore germination and so increase the disease potential, and determine the earliness of the attack and the build-up of inoculum. Maximum severity of infection depends upon the continuance of conditions favouring both fungal development and plant growth.

GARRISS (H. R.). **Tobacco blue mold control.**—*Ext. Circ. N.C. agric. Exp. Sta.* 348 (A), 11 pp., 2 figs., 1950.

A description is given of the symptoms, economic importance, and dissemination of tobacco blue mould [downy mildew] (*Peronospora tabacina*) [see preceding abstract], together with the effect of weather conditions on the development, spread, and severity of the disease, and methods of control by dusting [*R.A.M.*, 28, p. 597] and spraying [ibid., 26, p. 268]. When used as a preventive, 65 per cent. dithane Z-78 spray at the rate of ¾ lb. to 25 gals. water is as effective in controlling the disease as 76 per cent. fermate (1 lb. to 25 gals.) [loc. cit.].

Progress Report 1935-1948. Tobacco Division, Central Experimental Farm, Ottawa. —64 pp., 10 figs., 4 graphs, [1950].

In the introduction to the section on varietal improvement (pp. 14–22) F. H. WHITE states that the resistance of tobacco plants to black root rot (*Thielaviopsis basicola*) [*R.A.M.*, 28, p. 363] is dependent on two pairs of dominant factors, the degree of resistance being apparently influenced by the number of factors present in the strain. Resistance to mosaic virus [ibid., 29, p. 126] is due to two pairs of recessive factors.

During the period under review 323 segregating strains, derived from crosses between Resistant Havana 211 and cigar varieties susceptible to root rot have been examined for resistance. In 1945 18 strains were selected for yield and quality trials. In 1948 26 cigar strains, all of which are resistant forms of commercial varieties, have shown a high degree of resistance to *T. basicola*. These are in either the fourth or fifth backcross of the F_5 to F_8 generations. Of many hybrid Burley strains tested in the period only nine selected resistant strains were worthy of processing by 1948; they are in the third and fourth backcross of the F_1 and F_2 generations. Three highly resistant strains of dark tobacco (derivatives of the susceptible Greenwood and resistant Harrow Velvet) have been selected in the sixth backcross of the F_4 generation.

Two Bonanza, seven White Mammoth, one Warne, and three Yellow Mammoth selections in the third and fourth backcross of F_3 to F_4 were highly resistant to mosaic in 1948.

The results of rotation experiments are reported by L. E. GILMORE (pp. 30–32). When tobacco preceded tobacco for two years the variety Connecticut Havana 211, susceptible to black root rot, yielded 964 lb. per acre (average for 1939 and 1942), and Resistant Havana 211 1,595 lb. The best yield of the susceptible variety was obtained after two years of clover hay (1,197 lb.) and the smallest (890 lb.) after mangolds. Two successive years of *Phleum pratense*, clover, peas, or oats markedly improved the yields of the susceptible variety. In the case of the resistant variety two successive years of a number of preceding crops greatly reduced the returns, mainly due to brown root rot [ibid., 28, p. 90]. Maize was the most deleterious crop (1,240 lb. average for 1939, 1942, and 1945), followed in order by tomatoes, clover, *P. pratense*, potatoes, mangolds, oats, and peas (1,479 lb.). The experiments demonstrated the beneficial effect of *P. pratense*, clover, peas, or oats grown for only one year preceding a resistant variety, or for two years preceding a susceptible one.

Even at its best performance the susceptible variety averaged only 47 per cent. of the crop returns of the resistant one, following a year of clover or *P. pratense* hay. A three-year rotation is not sufficient to reduce the effects of *T. basicola*.

In a report of nutritional studies (pp. 43–50) E. T. McEvoy points out that tobacco plants suffering from potassium deficiency will recover if given an adequate supply of this element soon after the disorder is first observed. The ammonium contained in ammonium sulphate fertilizers was shown in sand cultures to be largely responsible for magnesium deficiency or 'sand drown' [ibid., 27, p. 201] in tobacco, although both components of the compound lower the magnesium content. Field experiments showed that on light sandy soils also heavy applications of ammonium nitrogen can induce magnesium deficiency.

Black (L. M.), Morgan (C.), & Wyckoff (R. W. G.). **Visualization of Tobacco mosaic virus within infected cells.**—*Proc. Soc. exp. Biol., N.Y.*, 73, 1, pp. 119–122, 8 figs., 1950.

Electron micrographs of sections through Turkish tobacco leaves infected with tobacco mosaic virus frequently reveal the presence of the latter in fibrous masses associated with severely damaged chloroplasts. The virus is clearly discernible in the cytoplasm of the infected cells, sometimes as single filaments of great length (much in excess of 2,800 A), indicating an end-to-end arrangement of the rods *in situ* [*R.A.M.*, 29, p. 177]. The nuclei appear to be virus-free and unaltered by the infective process.

Diachun (S.) & Valleau (W. D.). **Nicotiana rustica as a source of Tobacco streak virus.**—*Phytopathology*, 40, 2, pp. 128–134, 1 fig., 1950.

At the Kentucky Agricultural Experiment Station tobacco streak virus has proved somewhat difficult to transmit by mechanical means, especially to resistant species of *Nicotiana* [*R.A.M.*, 27, p. 65; 28, pp. 327, 491]. It was usually, but not uniformly, possible to obtain inoculum with high virus titre, as measured by the local lesions produced on rubbed tobacco leaves, from fairly young foliage of chronically diseased *N. rustica* plants crushed to a moderate extent with a glass spatula with an approximately equal volume of M/10 disodium hydrogen phosphate. The effects of age of prepared inoculum, age of leaves and vigour of plants used for inoculum, age of leaves rubbed, and amount of rubbing were eliminated as potential causes of variability. Virus activity of the inoculum was often reduced, however, by very thorough grinding, as well as by the admixture of healthy juice. The addition of sodium sulphite to inoculum prepared from young leaves of chronically diseased *N. rustica* counteracted the detrimental effect of thorough crushing. High-titre inoculum was produced consistently by grinding young *N. rustica* leaves with M/10 disodium hydrogen phosphate containing M/100 sodium sulphite, or with the latter alone.

Heggestad (H. E.) & Clayton (E. E.). **Occurrence of black shank and other diseases on Burley Tobacco in East Tennessee, in 1949.**—*Plant Dis. Reptr*, 34, 1, pp. 23–24, 1 fig., 1950. [Multilithed.]

During 1949 tobacco black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 28, pp. 326, 424, 425, 493; 29, p. 126] was found in eastern Tennessee for the first time. The outbreak was confined to Greene County, where about 35 farms were affected. The heaviest losses occurred in fields planted with tobacco the previous year. Wildfire (*Pseudomonas tabacum*) [ibid., 28, pp. 25, 209] was exceptionally widespread and destructive in plant beds. *Cercospora nicotianae* [ibid., 28, pp. 209, 312] reduced the yield and quality of late crops, and was the most destructive leaf disease.

Lavallée (E.). **Mildiou des Tomates. Résultats d'essais de pulvérisation en 1944.** [Tomato blight. Results of spraying tests in 1944.]—*Rep. Québec Soc. Prot. Pl., 1945–1947*, pp. 44–47, [? 1948].

During the summers of 1942 and 1943 tomatoes in Quebec became severely affected by blight [*Phytophthora infestans*]. In 1944 a comparative spraying test with Earliana tomatoes was carried out, but no blight developed. However, towards mid-August *Septoria* [*lycopersici*: *R.A.M.*, 22, p. 163] appeared on the basal leaves and by the middle of September had almost entirely defoliated some plants: infection was favoured by dense growth of the tomatoes. None of the fungicidal treatments had any effect on the disease and yields were less from the treated plants.

Beach (W. S.). **The effects of excess solutes, temperature and moisture upon damping-off.**—*Bull. Pa agric. Exp. Sta.* 509, 30 pp., 7 figs., 2 graphs, 1949.

This is a fully tabulated survey and discussion of the results of studies at the Pennsylvania Agricultural Experiment Station on the effects of excess solutes, temperature, and moisture on the development of pathogenic and physiogenic damping-off. Pea, tomato, spinach, and cucumber seedlings were grown in sand cultures and soil inoculated with *Rhizoctonia* [*Corticium*] *solani*, *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* [*R.A.M.*, 28, p. 91], and *Pythium ultimum*, all originally isolated from tomato. The sand cultures were supplied with Knop's solution at graded strengths, viz., 0·5, normal, 2, 4, 8, and 16 times normal.

Excess solutes greatly increased the incidence of pathogenic damping-off, especially that caused by *C. solani* and *F. bulbigenum* var. *lycopersici*, and were also an important factor in the development of the physiogenic form of the disease. Data on the ratio of host to pathogen growth rates at five different temperature levels (57°, 65°, 75°, 85°, and 95° F.) showed that this relationship largely determines the amount of pathogenic damping-off occurring during the period of seed germination and seedling emergence under otherwise optimal environmental conditions. In general, infection by *P. ultimum* is more severe at the lower levels and by *C. solani* at the higher. No definite conclusions as to the influence of temperature on the tomato wilt pathogen could be reached on the basis of these tests, but this factor is known to be of great significance in the later stages of host growth, when a range of 75° to 90° is very favourable to the extension of the disease. The severity of attack by *P. ultimum* rose progressively with increases in the soil moisture content from 44 per cent. to saturation. A similar trend was followed by *C. solani* up to 65 per cent. of saturation, after which its incidence fell abruptly. In tests on damping-off control by fungicides the treatment of tomato seed with new improved ceresan (five minutes' immersion in a 1 in 1,200 solution) was particularly effective in the production of relatively satisfactory stands at 45, 65, and 85 per cent. of soil saturation.

Strong (M. C.). **Comparison of fungicidal sprays for the control of Tomato blights.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 32, 3, pp. 338–347, 6 figs., 1950.

In Michigan the yields of marketable tomatoes are reduced almost annually by early blight (*Alternaria solani*), late blight (*Phytophthora infestans*), *Septoria* blight (*S. lycopersici*), and anthracnose (*Colletotrichum phomoides*) [*R.A.M.*, 28, p. 445]. Comparative spraying tests for the control of these diseases were conducted from 1946 to 1949 inclusive. Early blight was prevalent each season. Anthracnose and *Septoria* blight were abundant only in 1949 and they were introduced artificially. Five applications were made at 10- to 14-day intervals, beginning with the development of the first cluster of fruit. The highest yields were correlated with the least defoliation only in 1949, when disease incidence was very high. During the 1949 season the best control was obtained with 4–100 Crag 658 (copper zinc chromate)

[see below, p. 453] with which there was 53 per cent. defoliation and 21 tons fruit per acre, 4–100 tribasic copper (55 and 20·7), and 4–100 cop-o-zinc (57 and 19·2).

The following recommendations are given for the control of blights and anthracnose: crop rotation, ploughing under or burning crop debris at the end of the season, use of healthy plants only, spraying of seed-beds, weed control, and spraying or dusting when necessary.

Primost (Edith). **Dauerkontrolle des Körpergewichtes bei Pflanzenschutz- und Kulturmassnahmen.** [Permanent control of body weight in plant-protective and cultural practices.]—*Bodenkultur, Wien*, 4, 1, pp. 78–88, 2 figs., 4 graphs, 1950.

The first part of this paper deals with the effects on tomatoes, calculated by Werner's gravimetric method [cf. *R.A.M.*, 12, p. 681], of warm and cold watering and potting, and the second with the influence of certain plant-protectives on the same crop. Spraying with 0·5 per cent. copper oxychloride at a mean temperature of 17·5° C. and 90 per cent. relative humidity resulted in a 70 per cent. reduction, persisting for ten days, in body weight increments. On the other hand, no adverse effects followed the application of a 1 per cent. sulphur spray or A-tetrabar at the same strength.

Grancini (P.) & Cesaroni (F.). **Alcune osservazioni sul 'fern leaf' del Pomodoro in Italia.** [Some observations on 'fern leaf' of Tomato in Italy.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 53–57, 1950. [Mimeographed.]

Tomato fern-leaf virus [*R.A.M.*, 16, p. 639; 17, p. 78; 19, p. 386; 25, p. 14] which, in view of its high infectivity, would appear to belong to the tobacco mosaic group, is very common in market gardens near Milan, and in one instance 30,000 plants became infected a few days after transplanting. After the acute phase the symptoms became attenuated. When the side shoots were removed from 50 plants after the workers' hands had been infected with juice from diseased plants, some of the plants developed typical fern-leaf symptoms ten days later. When the artificial infection experiment was repeated in the field the severity of the symptoms varied considerably, especially on older plants.

Tomato plants experimentally infected in the spring of 1949 with herbarium material of the year before developed typical symptoms. Neighbouring plants were then similarly inoculated with material heated to 80° C. for 10 minutes, but no symptoms resulted, though a few weeks later the uninoculated controls developed the disease. The plants inoculated unsuccessfully with the heated material were re-inoculated with fresh, unheated juice from the infected controls, but only a slight mosaic of the young leaves developed.

Serodiagnosis was carried out with sera prepared for the identification of ordinary tobacco mosaic and cucumber mosaic viruses. Tomato plants showing typical fern-leaf from different market gardens gave positive reactions to both.

These results support, in many respects, Limasset's view (*Ann. Épiphyt.*, N.S., 12, pp. 181–202, 1946) that one form of fern-leaf is caused by a complex of ordinary tobacco mosaic virus and cucumber mosaic virus. Inoculations of White Burley, Samsum, and Resist. 142 tobacco with the authors' material gave severe mosaic in summer and local necrotic lesions in autumn, but the reason for this has not yet been ascertained.

Biraghi (A.). **La distribuzione del cancro del Castagno in Italia.** [The distribution of Chestnut canker in Italy.]—*Ital. for. mont.*, 5, 1, pp. 1–4, 1 map, 1950. [English and French summaries.]

Much of this information on the distribution of chestnut canker (*Endothia parasitica*) in Italy has already been noted [*R.A.M.*, 28, p. 428; 29, p. 236]. Additional localities in which the disease has been observed up to the end of 1949 are in the provinces of Bergamo and Salerno.

The disease attacks vigorous trees more readily than weakened ones. This was particularly striking in the provinces of Varese and Como where the trees died soon after initial infection. If infected trees are cut down this must be done at soil level, otherwise new shoots from the cut stump will be infected at the outset.

Gupta (S. L.). **Occurrence of Chestnut-blight in the Kumaon Hills.**—*Curr. Sci.*, 19, 1, pp. 13–14, 3 figs., 1950.

The sudden death of a 20-year-old chestnut tree in the Government Gardens, Chaubattia, United Provinces, in December, 1948, is attributed to *Endothia parasitica*, not hitherto recorded for India [C.M.I. map No. 66], which has since been found on up to 75 per cent. of the trees in plantations in the Kumaon Hills. The salient features of the symptomatology and morphology of the fungus are very briefly described.

Bretz (T. W.). **Leaf-bud cuttings as a means of propagating disease-resistant Elms.** —*Plant Dis. Reptr*, 33, 11, pp. 434–436, 1949. [Mimeographed.]

Results are presented showing that American elms resistant to phloem necrosis [cf. *R.A.M.*, 29, p. 65], classed as difficult to root, may be propagated by cuttings from eight-year-old trees consisting of leaf blade, axillary bud, and a shield of stem tissue, treated with a hormone dust and held under a constant mist. Potentially a new individual can be secured from each node of the current year's growth. The method has proved successful with *Ulmus americana*, *U. pumila*, *U. thomasi*, and *U. fulva* [ibid., 25, p. 191] and also with chestnut.

Shafer (Thelma) & Liming (O. N.). **Ceratostomella ulmi types in relation to the development of perithecia.**—Abs. in *Phytopathology*, 40, 1, p. 25, 1950.

The perithecia, asci, and ascospores of *Ceratostomella ulmi* collected on naturally infected elms in New Jersey and Colorado were smaller than those arising from artificially paired isolates. Isolates from perithecia found in nature, after a few months in the laboratory, failed to produced perithecia. Tests were performed on 54 mass isolates for their ability to form perithecia [cf. *R.A.M.*, 16, p. 142], alone or paired, on elm wood, with the following results: 28 type A isolates from 12 States in 384 pairings gave negative results, as also did nine of type B from the Indianapolis area, Indiana; in 240 paired cultures of the two types, 217 produced perithecia; eight isolates with type A characteristics gave rise to perithecia 10 times in 265 pairings with those of the same type, while four showing type B features produced perithecia in 73 pairings with the same type. One isolate each from Connecticut and Ohio formed perithecia in most cases when mated with isolates of either type A or B, and on one occasion one of these isolates was self-fertile. The isolates that were bisexual at first showed only type A characteristics at a later stage. Typical *C. ulmi* colonies were produced by most type A isolates on a potato sucrose agar medium, whereas those of type B tended to be atypical. Type B conidia fell largely within the lower limits of the size range reported for type A spores.

Pomerleau (R.). **Rapport général des travaux effectués sur la maladie hollandaise de l'Orme dans la Province de Québec en 1947.** [General report on the work done on Dutch Elm disease in the Province of Quebec in 1947.]—33 pp., 2 graphs, 8 maps, Quebec, Service Forestier, Ministère des Terres et Forêts, [? 1949. English summary. Mimeoprinted.]

During the summer of 1947 a survey was made of 36 counties of the Province of Quebec; 15,850 elms were examined and 1,633 sampled, cultures of *Ceratostomella ulmi* [*R.A.M.*, 27, p. 300; 28, pp. 439, 440; 29, p. 85] being obtained from 841. The disease now effects 32 counties and an area of over 10,000 sq. miles. Most of the diseased elms found were removed before the end of the winter in 1948.

Further studies on the inoculation of elms in nature [ibid., 27, p. 50] again showed

several cases where the inoculation site coincided with a gallery bored by *Hylurgopinus rufipes* in the thin bark of a small branch. This appears to be the chief means of entry of the fungus in Quebec. Other work by A. Robert showed that various insects, especially species of *Magdalis*, can transmit the disease under experimental conditions in cages.

Experimental inoculations of young elms made at weekly intervals from spring until autumn in 1946, showed that only elms inoculated in June and July developed wilting [cf. ibid., 28, p. 257]. After the second week in July the number of trees that wilted and the intensity of the wilt rapidly declined, falling to zero at the end of July. At the start of the season wilt usually developed in less than 10 or 12 days after inoculation. Up to 85 per cent. of the leaves of some trees (37 per cent. on the average) wilted. Two trees inoculated after leaf fall in October, 1946, developed wilt in the spring of 1947. It was further found that infection shows as streaks in the wood up to the end of the growing season. After 15th September the proportion of length and circumference of infected wood rapidly declined. Further work along the same lines in 1947 showed that inoculations were successful from the middle of May to the end of July, while (in that year) the most susceptible period was from 15th to 25th June. Of 290 trees inoculated in 1947 13 showed outward signs of infection in 1948. Trees inoculated in June and August, 1947, in many instances wilted again in the spring of 1948. Studies on the seasonal activity of the cambium in relation to the development of infection are in progress, as are experiments to determine during what period of the year *H. rufipes* conveys infection. Preliminary observations on rate of spread of the disease in the field indicated that infection is most intense where there are clumps of elms, and in villages, and near rivers.

The bacterium showing antagonism to *C. ulmi* in culture [ibid., 27, p. 300] was identified as a *Phytomonas*. In 1947 about 20 strains of bacteria belonging to the *Bacillus subtilis* group were found to possess the same property. Preparations were made for a study of the effect of spore dosage of *C. ulmi* on infection [cf. ibid., 26, p. 429].

Roth (E. R.). **Discolorations in living Yellow-Poplar trees.**—*J. For.*, 48, 3, Part 1, pp. 184–185, 1 fig., 1950.

To ascertain whether the discoloration of yellow poplar (*Liriodendron tulipifera*) [*R.A.M.*, 29, p. 237] known as 'blue butt' or 'mineral stain' could be reproduced by inoculation with bacteria, experiments were carried out near Asheville, North Carolina, in which ten bacterial mixtures were prepared from 65 isolates obtained from affected material in 1942. Two trees at least 10 in. in diameter at breast height were inoculated with each bacterial mixture through holes at three selected heights; in addition each had a closed and an open uninoculated wound. Six additional trees were mechanically wounded as follows: (1) axe cut into the heartwood made to hold water, (2) axe cut into the sapwood not to hold water, (3) ½-in. auger hole to hold water, (4) ½-in. auger hole not to hold water, and (5) two 20-penny spikes driven in on opposite sides.

Five years later the trees were felled and the wounds dissected. Growth had closed all except those made with the axe. Discolorations from the inoculations ranged from 8·8 to 21·1 in. in total length, and displayed the same colour variations as those found in naturally discoloured yellow poplar. The average length of the discolorations for the open and closed uninoculated holes was slightly more than for the inoculated wounds. There was thus no correlation between the introduced bacteria and the discolorations. Apparently neither free water nor introduced bacteria were required to produce staining, though free water increased the extent of discoloration. All large, open axe wounds resulted in both discoloration and decay, the former generally preceding the latter, which was not extensive and was due to *Collybia velutipes* and *Polyporus* [*Polystictus*] *versicolor*.

ROHWER (S. A.). **What economic studies and surveys are needed for development of a sound national program of insect and disease control?**—*J. For.*, 48, 3, Part 1, pp. 194–197, 1950.

In this paper, presented at a joint meeting of the Divisions of Forest Economics and Private Forestry at Seattle on 12th October, 1949, the author discusses the economic studies and surveys needed to develop a sound programme for the control of native and foreign diseases and pests attacking forest trees in the United States and the working of the contribution scheme of the Forestry Pest Control Act. For white pine blister rust [*Cronartium ribicola*: *R.A.M.*, 25, p. 570; 28, p. 653; 29, p. 95] economic studies and detection surveys are required. No project for disease control should be undertaken without economic justification. Detection surveys are to be expanded, for which purpose the country has been divided into eight districts, and the co-operation is invited of all who can assist.

HATTORI (S.) & NAKAHARA (K.). **On the sugar exudation from protuberances of Pine trunks.**—*Bot. Mag., Tokyo*, 61, 717–718, pp. 37–38, 1948. [Japanese, with English summary. Received May, 1950.]

From the middle of January to the beginning of February, pale yellow, sweet, watery drops exude from cracks in large wooden protuberances produced on the trunks of *Pinus densiflora* and *P. thunbergii* in central Japan by *Cronartium quercuum* [*R.A.M.*, 22, p. 46; 23, p. 198]. The yellow colour is due to the spermatia formed at the exudation of the liquid. The sugars detected were *d*-fructose and *d*-glucose, the amount of the former being 3·3 times that of the latter. The absolute amount of the sugars is estimated at about 3·7 per cent.

BLYTH (W.). **Studies on Gonatorrhodiella highlei A. L. Smith.**—*Trans. bot. Soc. Edinb.*, 35, 2, pp. 157–179, 9 pl., 1950.

This is an amplified account of studies on *Gonatorrhodiella highlei*, a shorter version of which has already been noticed [*R.A.M.*, 28, p. 652]. The fungus grew well in the presence of a species of *Nectria* (from poplar bark) [loc. cit.] on oatmeal mush, but not on potato dextrose, malt, or plain agars. *G. highlei* produces appressoria and an elaboration of hook cells of limited growth, which encircle the hyphae of the *N.* species. The effect of parasitism is slight, however, resulting in a thinning of the hyphae at points of contact with the hook cells. A limited growth of *G. highlei* occurred in pure culture on oatmeal mush and on fungal extract agars.

[DAY (W. R.).] **Forest pathology.**—*Rep. imp. For. Inst., Oxford, 1948–49*, pp. 11–15, 1950.

It is stated in this report [cf. *R.A.M.*, 27, p. 500] that the trunks of apparently uninjured Sitka spruces [*Picea sitchensis*] in an area of the Forest of Dean, where physiological root disease was present, were found to harbour a fungus flora. The same was true of all Norway spruces [*P. abies*] affected by bark necrosis and of drought-cracked spruces of both species.

STAHEL (M.). **Starkes Auftreten von Baumschwämmen.** [Extensive occurrence of tree fungi.]—*Schweiz. Z. Obst- u. Weinb.*, 59, 4, pp. 77–80, 2 figs., 1950.

Basidiomycetes were exceptionally prevalent in Swiss orchards in the late autumn of 1949, particularly on apple trees, *Polyporus* spp. and related genera being found on the branches and the much more dangerous honey fungus [*Armillaria mellea*] at the base of the trunk, in association with the 'squarrose scale' [*Pholiota squarrosa:* cf. *R.A.M.*, 16, p. 822]. For instance, in a 65-year-old stand of 66 apple trees in the canton of Aargau, 22 were affected in this way, and elsewhere the position was similar. In about one-third of the diseased trees the pathogen might

have entered through wounds, but in most cases the trunks and adjoining parts of the root system were free from injury, and infection had evidently spread through the soil by means of the rhizomorphs, as well as from the spores above ground.

All the affected trees had been subjected, five to ten years earlier, to drastic thinning, involving a reduction of the crown by up to two-thirds. Thus diminished, the foliar system is no longer adequate for wood and fruit production, much less for root nutrition, and a weakening of the entire tree ensues, particularly affecting the roots. In another orchard the fungi attacked only those trees that had been grafted with scions of the weakly growing Ontario, the scanty foliage of which, in contrast to Beauty of Boskoop, could not sustain the roots for any length of time.

Control measures, suggested by the foregoing observations, are briefly indicated.

Stevens (S. F.). **Water soluble wood preservatives. A résumé of some of the necessary requirements in protecting wood against various destructive agents.** —*Wood Prod.*, 53, 4, pp. 20, 22; 5, pp. 22, 24, 1948.

For successful commercial use the main requirements in a wood preservative are toxicity, permanence, penetration, safety in use, non-corrosiveness, ready availability, and cheapness. In addition it may need to be clean, odourless, colourless, paintable, fire- and moisture-resistant, and non-swelling.

The common toxic salt preservatives usually injected into the wood as aqueous solutions are reviewed. Chromated zinc chloride [*R.A.M.*, 28, pp. 103, 317; 29, p. 70] consists of 18·5 per cent. sodium dichromate and 81·5 per cent. zinc chloride by weight, and the recommended treatment is to leave 0·75 lb. dry salt per cu. ft. wood. The dichromate increases toxicity and retards the leaching of the zinc chloride by fixing it in the wood fibre. The treatment is specifically 'clean' and, according to the manufacturers, lumber preserved with this material is decay-resistant, termite-repelling, fire-retarding, odourless, paintable, non-corrosive, readily fabricated, and economical.

Zinc meta-arsenate [ibid., 28, p. 100] (a patented preservative developed by the Western Union Telegraph Company) is prepared by dissolving zinc oxide and arsenic trioxide (or equivalent compounds) in water acidified with acetic acid. Treatment consists in impregnation. The chief claims made for this material are its permanence and high toxicity.

The tanalith formula for Wolman salts [ibid., 26, p. 368] on the market at present consists of sodium fluoride 25, sodium chromate 37½, anhydrous disodium arsenate 25, and dinitrophenol 12½ per cent. [cf. ibid., 22, p. 84]. Detailed service records since 1925 of installations of Wolmanized lumber indicate that these salts are effective and are being increasingly widely used.

A typical solution of celcure [ibid., 22, p. 464] consists of 5·6 per cent. potassium dichromate, 5·6 per cent. copper sulphate, 0·25 per cent. acetic acid, and 85·5 per cent. water, while a dry form is also available. Data from laboratory and accelerated service tests tend to support the claims made for this preservative. Owing to its low cost and 'clean properties' it is being increasingly used commercially.

Patented in India in 1934, greensalt (also called ascu) [ibid., 23, p. 247; 28, p. 147] combines the toxic qualities of copper and arsenic with the 'fixing' properties of chromium salts. The formula consists of one part by weight of arsenic oxide, three parts copper sulphate, and four parts potassium dichromate. It is made up in a water-soluble powder, and the usual proportion is six parts by weight of the powder to 100 parts water. Laboratory tests indicate that it is toxic to fungi and termites and highly resistant to leaching. The Bell laboratories are experimenting with the preservative for pole use under the name 'greensalt', while the American Lumber and Trading Company have trademarked it for other uses as 'erdalith'.

A new wood preservative, chemonite, the active toxic ingredients of which are copper hydroxide and arsenic trioxide, appears to be satisfactory.

Schubert (W. J.) & Nord (F. F.). **Investigations on lignin and lignification. I. Studies on softwood lignin.**—*J. Amer. chem. Soc.*, 72, 2, pp. 977–981, 1 graph, 1950.

The net effect of the action of *Lentinus lepideus*, *Poria vaillantii*, and *Lenzites sepiaria* on white Scots pine (*Pinus sylvestris*) and white fir (*Abies concolor*) woods was shown by studies conducted at Fordham University, New York, under the auspices of the Office of Naval Research, to be a depletion in the cellulose content of the wood, accompanied by a corresponding increase of lignin [cf. *R.A.M.*, 29, p. 239]. After seven months of decay by *Lentinus lepideus* there is an approximately twofold increase in the yield of alcohol-extractable lignin from the decayed wood as compared with that obtained from sound material of the same species. The native lignin of Scots pine and the substance liberated from this wood by enzymatic degradation of the wood cellulose appear to be identical. Data are presented indicating that native lignin is a chemical entity which is identical in various softwood species. Lignin preparations isolated with 70 per cent. sulphuric acid, fuming hydrogen chloride, or 10 per cent. sodium hydroxide do not resemble native lignin nearly so closely in chemical composition as the lignin obtained after enzymatic decay of the wood.

The possible steps involved in the mechanism of lignification are discussed.

Pehrson (S. O.) & Lindberg (N. J.). **Några erfarenheter från användningen av organiska kvicksilver-föreningar för behandling av våt slipmassa under år 1949.** [Some of the experience gained in the application of organic mercury compounds for the treatment of wet groundwood pulp during the year 1949.]—*Svensk PappTidn.*, 52, 22, pp. 560–562, 1949.

Swedish post-war experiments in the treatment of wet groundwood pulp with organic mercury compounds are reviewed. Difficulties in connexion with transport at the beginning of 1949 necessitated the application of disinfectants to bales liable to protracted storage either at the Swedish mills or on arrival in England. In general, the use of BSM-11B [*R.A.M.*, 29, p. 325] or pulpasan F [cf. ibid., 24, p. 349] (both containing phenyl mercury compounds as their active principle) gave satisfactory results. Even at the minimum dosage of 150 gm. per ton pulp they destroyed a large proportion of the rotting and blueing fungi, which were particularly prevalent in the lots stored in England, where weather conditions during the summer favoured their development. However, even at the maximum concentration of 250 to 300 gm. per ton the fungicides did not completely eliminate the staining organisms, of which the most persistent, causing a purple discoloration, was identified as *Penicillium roqueforti* [see next abstract]. The inhibiting concentration of phenyl mercuric acetate in malt agar cultures of this species is about four times higher than that required to kill *Aspergillus niger*. On the other hand, *P. roqueforti* is more sensitive than *A. niger* to sodium pentachlorophenol, the former succumbing to a concentration 40 to 60 per cent. lower than that necessary to destroy the latter.

In experiments to determine the resistance to heat of some mercury-tolerant strains of *Penicillium*, only 2 per cent. of the conidia withstood an hour's exposure to a temperature of 65° C. and 0·5 per cent. 45 minutes at 70°, while an hour at 75° was lethal to all. A substantial reduction of mould damage could therefore be effected by raising the temperature of the system, and the simultaneous application of a mercury fungicide would eliminate the increased risk of rotting consequent on storage. In these preliminary tests, moreover, the efficacy of organic mercurials was found to increase parallel with rising temperature. For instance, whereas

half-an-hour's exposure to phenyl mercuric acetate at a concentration of 16 mg. per l. water was virtually innocuous to the conidia of *P. roqueforti* at 20°, only 5 per cent. survived treatment with a dosage of 1 mg. at 50°, and 2 mg. at the same temperature resulted in complete sterility. Further experiments in the treatment of pulp with organic mercury compounds at temperatures of 50° and upwards are to be undertaken. The usual procedure of incorporating the disinfectant immediately before Kamyr-drying does not effectively eliminate the mercury-tolerant species of *Penicillium* from the system, and certain other fungi, e.g., *Phoma lignicola* [ibid., 25, p. 241], may also survive it. In such cases the sterilization of the system by means of 'shock' dosages at appropriate intervals might be attempted.

In conclusion a brief note is given on the authors' visits to some large English paper mills where Swedish pulp (both groundwood and sulphite) had been in storage, in several cases for three to five months. Rotting and blue stain of untreated material were widespread, even in comparatively fresh bales. Keen interest was shown in the treatment, the results of which were regarded by experienced representatives of the mills to be the best hitherto achieved.

Appling (J. W.), Buckman (S. J.), & Meals (R. N.). **A mold with a high resistance to organomercurials. Penicillium roqueforti Thom.**—*Tappi* (Tech. Ass. Pulp Pap. Ind.), 32, 7, pp. 300–302, 1 fig., 1949.

The sole surviving mould in groundwood pulp treated with phenyl mercuric acetate at the Buckman Laboratories, Inc., Memphis, Tennessee [*R.A.M.*, 29, p. 325] was identified, with the co-operation of Drs. K. M. Raper, Johanna Westerdijk, and C. M. Christensen, as *Penicillium roqueforti* [see preceding abstract], which is believed to be fairly common in Scandinavian pulp mills and may also be one of the undetermined species frequently observed in American and Canadian pulp and slime samples. The inhibiting concentration of phenyl mercuric acetate in malt agar cultures of *P. roqueforti* was about 8 p.p.m., a value some four times that obtained for *Aspergillus niger*. The inhibiting concentration of sodium pentachlorophenate was about 40 to 60 per cent. less for *P. roqueforti* than for *A. niger*. Chemical analyses of uninoculated groundwood pulp mats, with and without added nutrients, were compared with those of similar specimens subjected for nine weeks to the action of *P. roqueforti*. The resultant changes were so insignificant, even in the presence of highly stimulatory nutrients, that they would be unlikely to impair the utility of the pulp to any appreciable extent.

Chisholm (T. H.) & Suggitt (J. W.). **Copper pentachlorophenate as a wood preservative.**—*Chemistry in Canada*, 1, 6, pp. 30–33, 1 fig., 1949.

A procedure has been devised at the Hydro-Electric Power Commission of Ontario for the treatment of red and jack pine (*Pinus resinosa* and *P. banksiana*) poles with copper pentachlorophenate [cf. *R.A.M.*, 27, pp. 147, 436], which is fungicidal to *Lentinus lepideus* and *Lenzites sepiaria* at 0·001 per cent. and to *Fomes pini* at 0·002 per cent. It exerted a fungistatic action on the two former species at 0·0005 per cent. and on the last-named at 0·001. Experimental treatments were carried out by the full-cell pressure process (four hours at 180 psi) in a chamber of $\frac{3}{8}$-in. steel plate with a capacity of 200 cu. ft., the working tank holding 1,000 gals. The dilute aqueous ammonia organic solvent in the copper pentachlorophenate solution is corrosive to brass, and therefore all treating equipment must be of iron or steel. The retentions in the four charges of treated material (130 stubs 9 ft. long and 6 to 12 in. in diameter) ranged from 0·05 to 0·4 lb. copper pentachlorophenate per cu. ft. As long as the ammonia concentration in the solution remained above 2 per cent. and the organic solvent above 10 per cent., the copper pentachlorophenate was held in solution, but as soon as the ammonia had

evaporated it became insoluble: this process, however, was not accomplished until several weeks after the poles were removed from the treating cylinder.

KEELEY (D. E.). **The preservation of timber by chemical treatment at McIntyre.**—*Canad. Min. metall. Bull.* 451, pp. 606–617, 14 figs., 3 diags., 1949.

A detailed, tabulated account is given of the methods employed and the results achieved in the preservation of timber against dry rot (*Merulius lacrymans*) at McIntyre Porcupine Mines, Ltd., Schumacher, Ontario. Treatment has been carried out since 1934, with 4·5 per cent. zinc chloride until the early part of 1945, when it was replaced by chromated zinc chloride [see above, p. 444] at the same strength. The treatment, which also acts as a fire retardant, is applied to 260,000 cu. ft. of timber per annum. At the much larger neighbouring Hollinger mine, 430,000 cu. ft. are treated annually with osmotite special, consisting of 76 per cent. sodium fluoride, 13 per cent. dinitrophenol, and 11 per cent. potassium chromate, which gives very good control of dry rot.

[This paper also appears in *Trans. Canad. Min. Inst.* (*Inst. Min. Metall.*), 52, pp. 272–283, 1949].

BROWNE (F. L.). **Water-repellent preservatives for wood.**—Reprinted from *Archit. Rec., 1949*, 3 pp., 1 fig., 1949.

Water-repellent products for wood are grouped for convenience into five categories, namely, Non-Swelling Paintable water repellent, NSP preservative, NSP water repellent preservative, wood sealer, and preservative wood sealer. All are particularly useful where conditions of service are not very severe. Sapwood and other kinds of wood not treated in the past, which absorb moisture quickly and are subject to rots, are specially benefited. The preferred method is by dipping, but brushing, spraying, mopping, and roller coating are also used, although superficial treatments afford only a limited penetration and absorption [cf. *R.A.M.*, 29, p. 189]. The NSP preservatives are solutions of fungicides or fungicides and insecticides in volatile solvents. For treating window sashes and millwork a content of not less than 5 per cent. by weight pentachlorophenol [ibid., 28, p. 608; 29, p. 69], or tetrachlorophenol, or chloro-2-phenylphenol, or mixtures of these is required. Commercial preservatives contain zinc naphthenate or copper naphthenate [ibid., 29, p. 1]. When applied by superficial methods the NSP preservatives protect wood effectively against blue stain fungi and decay only when it is not continually exposed to humidity. Water-repellent preservatives, which contain ingredients for both water-repelling and preservation in the same mineral spirits solution, impart moderate resistance to both moisture changes and fungi. Preservative wood sealers also contain fungicides, but the water-repellent preservatives penetrate deeper into the wood and are therefore superior protectants against fungal attack.

Determining penetration of wood preservatives.—*Tech. Note For. Prod. Lab. Wis.* 163, 2 pp., 1949. [Mimeoprinted.]

In this note (revised June, 1949) the chemical tests used by the Forest Products Laboratory, Wisconsin, to determine the depth of penetration of wood preservatives are briefly described.

ERDTMAN (H.) & RENNERFELT (E.). **Fungicidal properties of some constituents of the heartwood of Tetraclinis articulata (Vahl) Masters.**—*Acta chem. scand.*, 3, 8, pp. 906–911, 1949.

Under the joint auspices of the Royal Technical College and the State Forest Research Institute, Stockholm, investigations were carried out on the toxicity to wood-destroying fungi of thymol and three substances occurring in the wood of

Tetraclinis articulata (Vahl) Masters (*Thuja articulata* Vahl), namely, carvacrol, hydrothymoquinone, and thymoquinone.

In tests to determine the relative efficiency of the four substances in the inhibition of mycelial growth in malt extract agar cultures, thymol was effective against *Poria vaporaria* at a concentration of 0·005 per cent., *Lentinus lepideus* and *Merulius lacrymans* at 0·01, and *Coniophora puteana* at 0·02. Carvacrol checked the growth of *C. puteana*, *M. lacrymans*, and *P. vaporaria* at 0·01 and of *Fomes marginatus* and *L. lepideus* at 0·02 per cent. *M. lacrymans* succumbed to 0·002 per cent. hydrothymoquinone, *C. puteana* and *L. lepideus* to 0·05, and *P. vaporaria* to 0·1. At the maximum of 0·02 per cent. thymoquinone suppressed the development of *C. puteana*, *L. lepideus*, and *M. lacrymans*, but not that of *F. marginatus* or *P. vaporaria*.

Unpublished observations show that certain natural fungicides, such as pinosylvin [*R.A.M.*, 25, p. 241], inhibit the germination of *Polyporus* [*F.*] *annosus* spores, which contribute to the spread of the root rot [ibid., 29, p. 391], at a lower concentration (0·0025 to 0·005 per cent.) than is required for a comparable action on the mycelium. In tests to ascertain the relative toxicity of the four experimental substances to the spores of *F. annosus*, thymol, carvacrol, and thymoquinone inhibited germination at 0·05 per cent. while a concentration of 0·1 per cent. was necessary in the case of hydrothymoquinone. Less than 5 per cent. germination occurred in the presence of 0·025 per cent. thymol or thymoquinone, while carvacrol at the same strength permitted 5 to 20 per cent. The same level was reached in the presence of 0·01 per cent. thymoquinone and 0·005 per cent. thymol.

Experiments were also performed on spore suspensions in malt agar solutions of the following blue stain and yeast-like fungi: *Cladosporium herbarum*, *Ophiostoma* [*Ceratostomella*] *piceae*, *O.* [*C.*] *pini*, *Phialophora fastigiata*, *Phoma lignicola*, *Pullularia pullulans*, *Penicillium janthogenum*, *Rhodotorula glutinis*, and *Torulopsis pulcherrima*. The inhibition limits were approximately 0·01 to 0·02 per cent. for thymol, 0·02 to 0·05 per cent. for carvacrol, 0·02 to 0·05 per cent. for hydrothymoquinone, and 0·01 to 0·02 per cent. for thymoquinone. *P. janthogenum* seemed to be somewhat more resistant than the other species tested.

From these data it is concluded that hydrothymoquinone is about equally active with phenol and that its toxicity is enhanced by conversion into thymoquinone. The simple phenols, thymol and carvacrol, possess stronger fungicidal properties than hydrothymoquinone.

Snyder (W. C.), Hansen (H. N.), & Wilhelm (S.). **New hosts of Verticillium albo-atrum.**—*Plant Dis. Reptr*, 34, 1, pp. 26–27, 1950. [Multilithed.]

Verticillium albo-atrum [*R.A.M.*, 22, pp. 219, 323; 28, p. 245; 29, p. 333] was isolated by the writers and others, apparently for the first time, from cabbage, Brussels sprouts, radish, heather (*Erica australis* and *E. persoluta*), Transvaal daisy (*Gerbera jamesoni*), and pistachio (*Pistacia vera*); new host records for the United States were olive [cf. ibid., 28, p. 226] and nightshade weed (*Solanum nigrum*), and for California Crandall blackberry (*Rubus allegheniensis*). Inoculation experiments demonstrated that the isolates from cabbage and radish were cross-infective; those from Brussels sprouts, cabbage, stock (*Matthiola incana*), radish, and nightshade were non-pathogenic to Bonny Best tomato in greenhouse inoculation tests in which washed roots were dipped in a spore suspension. Isolates from olive and blackberry caused severe wilt in tomato.

Snyder (W. C.) & Baker (K. F.). **Occurrence of Phoma lingam in California as a subterranean pathogen of certain crucifers.**—*Plant Dis. Reptr*, 34, 1, pp. 21–22, 1950. [Multilithed.]

Black leg (*Phoma lingam*) [*R.A.M.*, 29, p. 282] occurs as a subterranean disease of some cultivated crucifers in San Mateo, Santa Cruz, and Santa Barbara counties,

California. The evidence indicates that once the fungus is introduced into a field with seed or infected transplants it may persist indefinitely even under semi-arid conditions if crop rotation is not practised. Aerial infections of cultivated crops were not found and survival appears to depend on invasion of subterranean parts of crucifers continuously cropped. The importation of seed from humid areas may supplement and replenish the inoculum carried over from season to season in infected refuse. The seed from diseased crucifers in California is uninfected, owing to the absence of the aerial phase of *P. lingam*.

HEAN (A. F.). **A South African virus disease of crucifers.**—*Sci. Bull. Dep. Agric. S. Afr.* 254, 15 pp., 5 figs., [? 1949].

During the last few years cauliflower and cabbage plants in the Pretoria and Johannesburg districts, Transvaal, have been affected by a virus disease [cf. *R.A.M.*, 28, p. 511], the infection in the former area ranging from 5 to 75 per cent. for cauliflower, and from 1 to 40 per cent. for cabbage. Stocks (*Matthiola incana*) [cf. ibid., 25, p. 67] were also infected (2 to 15 per cent.), especially in commercial plantings in and near Johannesburg. All commercial varieties of cauliflower, which suffers the greatest damage, are being attacked. If infected early the plants are severely stunted and the heads are very poorly developed, sometimes with scattered brown patches, and only a few small, twisted leaves surround them. The heads tend to develop rapidly and become loose and open. The affected young leaves show vein-clearing; later the areas along the veins become dark green, and the tissue between the bands yellowish-green. In older leaves the green veinbanding remains only along the secondary veins. Brownish-red, necrotic patches appear, which become dry and brittle. Often the leaves are distorted unilaterally; they tend to turn yellow and drop more rapidly than healthy ones. The symptoms in the field are most evident two to three weeks after the onset of cold weather, but are also noticeable in the summer. Not much harm is caused to cabbage plants, apart from slight stunting and premature yellowing and shedding of a few outside leaves. The leaf symptoms closely resemble those on cauliflower, except that the vein-clearing is mostly more pronounced and the veinbanding less so. Infected stock plants are stunted, have a bunched appearance, and the leaves show vein-clearing and in some cases severe distortion. 'Breaking' [ibid., 14, p. 172] of the flower colour of darker varieties is common in the field, but not in the greenhouse.

Of 24 cauliflower seedlings inoculated in the greenhouse with the virus (obtained from an infected cauliflower plant in Pretoria in October 1937) with the aid of carborundum, at an average range of temperature between 17° and 31·5° C., 11 showed the first symptoms within 21 days. *Myzus persicae* and *Brevicoryne brassicae* were both efficient vectors, infecting an average of 60 per cent. of the test plants. The incubation period for insect transmission was also about 21 days.

Very limited tests indicated that the longevity *in vitro* may be about 24 hours, or less. At a dilution of 1:50 infection was considerably less than for undiluted sap.

In addition to the three natural hosts, turnip [cf. ibid., 28, p. 318], broccoli, radish, wallflower, and in one experiment *Datura stramonium* were artificially infected.

It appears that the virus is closely related to cauliflower mosaic virus as determined by Tompkins in 1934 and 1937 [ibid., 14, p. 207; 17, p. 6; 28, p. 262], to Larson and Walker's mosaic disease of cabbage [cauliflower mosaic virus: ibid., 19, p. 65], and turnip mosaic virus, described by Chamberlain [ibid., 16, p. 359], but further studies are necessary for certain identification.

PAPE (H.). **Stand unserer Kenntnisse über die Kräuselmosaikkrankheit (Viruskrankheit) der Kohlrübe.** [Status of our knowledge concerning the curl mosaic disease (virus disease) of the Swede.]—*NachrBl. dtsch. PflSchDienst.* (*Braunschw.*), 1, 9, pp. 123–125, 2 figs., 1949.

Some of the information on the mosaic virus disease affecting swedes [turnip mosaic virus: see next abstract] in Germany has already been presented [*R.A.M.*, 16, p. 10], but the following points from more recent contributions may be of interest. According to Kaufmann (*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 59, pp. 65–72, 1939), the disease was reported before the second world war from Mecklenburg, Brandenburg, Silesia, Lippe, Oldenburg, Westphalia, and the Rhineland. It then appears to have been quiescent until 1948, when exceptionally heavy infection occurred in the north-east of Schleswig-Holstein, and was also reported by Rademacher from Württemberg (*Württ. Wbl. Landw.*, 116, pp. 6–7, 1949), where observations on diseased and healthy plants (100 of each) revealed losses of 67·7 per cent. leaf material and 72·1 per cent. roots. Rademacher estimates that an average infection of 60 per cent. in fields covering an area of 50 ha. would entail losses of 17,190 doppelzentner [1 doppelzentner = 100 kg.] roots and 2,700 doppelzentner leaf material. Seed production, too, is drastically reduced or may fail entirely.

The turnip mosaic virus overwinters in swedes taken from diseased stands and stored in cellars or clamps for spring planting. Even plants with no external symptoms of infection may harbour the virus, as the writer found in the spring of 1949, when swedes taken from infected fields in the previous autumn and planted in an insect-proof greenhouse cage developed almost 100 per cent. diseased foliage. On the other hand, no evidence of seed-borne infection has yet been obtained and in a further test under controlled conditions in the spring of 1949, 100 swedes taken from diseased plants in the preceding autumn gave rise to healthy progeny.

Saaltink (G. J.). **Een virusziekte in Stoppelknollen.** [A virus disease of Turnips.] — *Tijdschr. PlZiekt.*, 56, 1, pp. 95–98, 2 figs., 1950. [English summary.]

In the autumn of 1949 a virus disease new to Holland was observed on turnips in a field at the Phytopathological Institute, Wageningen. At first the three or four oldest leaves appear normal, while those following them are crinkled, misshapen, and often coarsely mottled. At a later stage the oldest leaves are shed, leaving the crumpled, short heart leaves in the form of a rosette. By this time the foliage has generally assumed a darker colour than that of healthy plants, and many of the leaves show a striate necrosis of the petioles and veins.

The diseased plants occur sporadically or in groups (so-called 'nests') among the healthy ones. Especially in the 'nests' the radial spread of the virus from one or more plants in the centre is clearly discernible, the symptoms of the delayed infection at the periphery being milder than those in the middle. Bare patches may ultimately appear in the stands through the severe defoliation of infected plants. The disease was later observed in other parts of the country, especially in the south, and symptoms of the same type also appeared on winter rape seed. The prominence of the virus in the past autumn may have been connected with the abundance of late aphids and perhaps also with the high September temperature (± 23° C.), which induces a stronger reaction on the part of the host.

The Dutch turnip disease appears to be identical with the turnip mosaic virus reported from the United States [*R.A.M.*, 18, p. 223; 24, p. 438] and New Zealand [ibid., 16, p. 539], and also presents analogies with the virus affecting swedes and other crucifers in Germany [ibid., 18, p. 811] and with the curl mosaic of swedes recently reported from the last-named country [see preceding abstract].

Angell (H. R.). **Seedling blight. I. Seed colour and soil in relation to pre-emergence blight of William Massey Peas.**—*Aust. J. agric. Res.*, 1, 1, pp. 33–42, 1950.

The emergence of William Massey peas, supplied by nineteen growers and grown in a local soil, varied from less than 50 to over 80 per cent., that of green peas

being significantly higher than that of yellow ones [*R.A.M.*, 28, p. 151]. The emergence of yellow-green peas was intermediate. The poor emergence of the yellow was due partly to a fraction of seed of low vitality common to all colours and partly to a low degree of resistance to [unspecified] fungus infection. The percentage emergence in (*a*) a fertile soil from a Duntroon farm, (*b*) a poor soil from the Plant Industry Experiment Station, Canberra, and (*c*) a very infertile soil from Penrose pine plantation, was 39, 60 and 83·5, respectively. These differences were due mainly to the influence of the soil environment on the susceptibility of the yellow pea fraction to pre-emergence blight (*Pythium ultimum*) [ibid., 28, p. 203; and above, p. 439]. The percentage emergence of both types could be varied significantly by varying the soil in which the seed was sown and allowed to grow for three days after germination.

Besides the usual dusting methods control of pre-emergence blight may be improved by the use of resistant seed and the selection of suitable soils for sowing.

In an appendix on the name *P. ultimum* it is stated that since zoospores are lacking in this species [but see ibid., 26, p. 131; 29, p. 309] the generic name appears to need revision.

Wallen (V. R.), Sutton (M. D.), & Skolko (A. J.). **The effect of actidione on the growth of certain pathogenic fungi and on the germination of Pea seed.**—*Phytopathology*, 40, 2, pp. 156–160, 3 figs., 1950.

Preliminary tests were carried out at the Science Service, Department of Agriculture, Ottawa, to determine the effect of actidione [*R.A.M.*, 29, p. 417 and below, p. 454] on certain seed-borne fungi and its possible application in the treatment of pea seed. Using Waksman and Reilly's agar streak method [ibid., 25, p. 130], spore suspensions of the following species were streaked on agar plates prepared with crude actidione at dilutions of 1, 5, 10, 15, and 50 p.p.m.: on pea agar *Ascochyta pisi* and *Fusarium poae* [ibid., 26, p. 51; 28, p. 520]; on malt agar *Colletotrichum lindemuthianum*, *Alternaria brassicicola*, *Helminthosporium sativum*, *Chaetomium globosum*, and *Penicillium* sp.; and on potato dextrose agar *Botrytis cinerea*.

After incubation for five days at 21° to 24° C. the growth of *Colletotrichum lindemuthianum* and *Ascochyta pisi* was totally inhibited at a dilution of 1 p.p.m., while that of *F. poae* was sharply depressed at the same concentration and entirely arrested at 10 p.p.m. The development of *Alternaria brassicicola* was retarded at 1 p.p.m, reduced to a trace at 15, and completely inhibited at 50 p.p.m. Up to 15 p.p.m. actidione was only slightly fungistatic to *Chaetomium globosum*, *H. sativum*, and *B. cinerea*, but at 50 the growth of all three species was greatly delayed, though not brought to a standstill. The effect of the antibiotic on the *Penicillium* was negligible even at the maximum concentration. The species with thin-walled, pale spores proved most susceptible to actidione.

The germination of *A. brassicicola* and *H. sativum* spores in hanging-drop mounts was substantially reduced by 48 hours' contact with actidione at 15 p.p.m., and the germ-tubes were abnormally short and swollen. At the same concentration the total germination of *C. globosum* was only about half that of the control, but the germ-tubes were much better developed. A similar reaction to the antibiotic was observed in *B. cinerea*.

Vincent and Vincent's filter paper disk method (*Proc. Soc. exp. Biol., N.Y.*, 55, pp. 162–164, 1944) was used for the determination of the effect of actidione on the growth of mycelial colonies of the above-mentioned fungi. At dilutions from 1 to 225 p.p.m., mycelial development was not impeded at the point of contact between the disk saturated with the antibiotic and the fungus colony in any of the species tested. Actidione not only failed to eliminate seed-borne infection by *Ascochyta pisi* in Lincoln and Thomas Laxton peas but exerted a toxic effect on the seedlings,

expressed in a marked reduction of germination [cf. below, p. 473]. After ten days in actidione (1 p.p.m.) the root systems of pea seedlings were abortive and discoloured, while the shoot was abnormally long and stout. At 5 p.p.m. these effects were even more accentuated, while at and above 10 p.p.m. germination was almost entirely inhibited and saprophytic fungi and bacteria developed in profusion.

Cohn (Adah E.) & Dezeeuw (D. J.). **Response of certain varieties of Snap Bean (Phaseolus vulgaris) to seed treatments.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 32, 3, pp. 386–401, 1950.

In the summer of 1948, at the Michigan State College Farm, ten varieties of snap bean (*Phaseolus vulgaris*) were treated with five seed protectants to determine the effect on damping-off [*R.A.M.*, 27, p. 54]. Spergon [loc. cit.] at 4 oz. per 100 lb. caused a significant increase in germination in 30·5 per cent. of the tests. Seven varieties were benefited by it in one or more plantings. L. 224 (zinc mercury chromate) at 4–100 increased germination in 28·3 per cent. of the tests, and the increases were larger on the average than with spergon. Arasan (2–100) was rated third (19·6), while Dow F800 and L640 (zinc copper chromate) both at 4–100 were toxic to certain varieties. Treatment with L640 at 2–100 caused no injury and increased germination in 31·3 per cent. of the tests.

Varietal differences in reaction to the protectants and an interaction of varieties, chemicals, and environmental conditions were observed. The treatments caused generally greater germination increases in wax bean varieties than in green beans.

Meiners (J. P.). **Bean diseases in southern Idaho in 1949.**—*Plant Dis. Reptr*, 34, 1, p. 14, 1950. [Multilithed.]

During the summer of 1949 dry root rot (*Fusarium solani* f. *phaseoli*) [*R.A.M.*, 28, p. 471; 29, p. 133] was almost co-extensive with the snap and dry bean [*Phaseolus vulgaris*] crop in southern Idaho, and caused heavy damage. *Pythium* wilt (*P. butleri*) [*P. aphanidermatum*: ibid., 11, p. 218; 15, p. 339] was present in all those fields inspected which were planted with Refugee varieties, and was causing damage in some. Red node [ibid., 29, p. 345], recently reported to be due to a strain of tobacco streak virus [cf. ibid., 28, p. 85], was very widespread, though the percentage of infection was high only on one farm near Shoshone. Shiny or greasy pod virus was widespread in snap varieties susceptible to common mosaic [ibid., 29, p. 345].

Dana (B. F.) & Vaughan (E. K.). **Experiments in control of white mold of Beans by fungicides applied as dusts and sprays.**—*Plant Dis. Reptr*, 34, 1, pp. 8–14, 3 graphs, 1950. [Multilithed.]

A further experiment was carried out in Oregon on the control of *Sclerotinia sclerotiorum* [*R.A.M.*, 28, pp. 371, 435; 29, p. 341] on Blue Lake kidney beans [*Phaseolus vulgaris*] under conditions of restricted aeration and over-irrigation. Diseased bean plants from the 1948 plots were left on the soil, refuse containing sclerotia from cabbage and pumpkin was distributed over the area and sclerotia from cultures were sown along the rows when the plants were 6 to 8 in. high. Uniformly severe infection resulted. Treatments were applied at weekly intervals from 25th July until 29th August; though 48 hours intervened between irrigation and fungicidal application, the soil was very wet and the plants covered with dew when dusted; spray applications were made later on the same day. After dusting with zerlate, zerlate+sulphur (1 to 9), C.O.C.S. (copper oxychloride sulphate)+ kolodust (1 to 4), flotox, kolodust, and bismuth subsalicylate the number of aerial infection centres per 32 ft. row on 5th September was 28·4, 62·2, 54·6, 43, 61·2, and 48·6, respectively, compared with 76·2 for the untreated; there were 15, 17·6, 18·6, 11·4, 16·6, and 22·2 basal infection centres, respectively, as compared with 22·2 for the controls. The corresponding figures for spray applications of zerlate, sulforon,

zerlate+sulforon (1 to 4), and bismuth subsalicylate were, respectively, 53·2, 52·4, 35·8, and 55·2 aerial infection centres, controls 93·6, and 14·2, 14, 10·2, and 13·8 basal infection centres, controls 21. Of spray materials not used in the earlier experiments, Crag 658 (copper zinc chromate) [cf. ibid. 29, p. 295], cop-o-zinc, fermate, fermate+sulforon (1 to 4); monsanto CP-546, and actidione gave, respectively, 40, 28·75, 40·25, 22·75, 60·25, and 59·75 aerial infection centres per 26 ft. row (mean of four replicates), as compared with 76·5 for the untreated, and 13, 10·25, 6·75, 6.25, 16, and 14·5 basal infections, respectively, as compared with 23 for the untreated.

Armstrong (G. M.) & Armstrong (Joanne K.). **Biological races of the Fusarium causing wilt of Cowpea and Soybeans.**—*Phytopathology*, 40, 2, pp. 181–193, 1 diag., 2 graphs, 1950.

Field observations on four soy-bean varieties, namely, L. Z., Yelnando, Mammoth Yellow, and Yelredo, and on 23 varieties or breeding lines of cowpea grown in *Fusarium*-infested plots, combined with greenhouse inoculations with the same *Fusarium* wilt isolates from both hosts, indicated the existence of at least two and probably more physiologic races on the basis of pathogenicity. Race 1, obtained from both hosts, caused wilting of Lady Finger, Florida Conch, Brown Sugar, Chinese Red, Sumptuous, Dixie Queen, Calva-7, Brabham Lady (Morse), and Rice or Lady (Wood) cowpeas, and of Mammoth Yellow and Yelredo soy-beans. On the other hand, race 2, isolated exclusively from cowpeas, was highly pathogenic only to certain varieties of this host, such as California Blackeye-5 and Ramshorn (both 100 per cent.), L.Z. and Yelredo soy-beans sustaining little damage. Lady Finger and Sumptuous cowpeas served as excellent differentials for the two races, succumbing fairly quickly to the race to which each was susceptible (1 in the case of the former, with 96·1 per cent. infection, and 2 in that of the latter, with 95·5), but being almost free from symptoms when infected by the other one, race 1 causing only 2·2 per cent. infection of Sumptuous and Lady Finger being immune from 2. Brown Sugar Crowder was susceptible to both races (81·4 per cent. infection with 1 and 68·1 with 2) and Iron and Brabham generally resistant, the former remaining free from attack by either race and the latter reacting to 1 with 18·2 per cent. wilt and to 2 with 3 per cent. Some of the inoculated varieties showed few external symptoms of wilt, but vascular discoloration was fairly extensive. Two soy-bean isolates caused wilting of this host, but not of cowpeas, and were further characterized by different host relationships from those of two other isolates. Some of the isolates lost their pathogenicity for soy-beans but not for cowpeas.

A number of plants inoculated with one or more isolates of races 1 and 2 showed no outward signs of wilt, but the former produced slight vascular discoloration in *Cassia tora*, lucerne, and pigeon pea. Cowpeas of differential varieties inoculated with virulent *Fusarium* wilt isolates from cabbage, *C. tora*, cotton, *Crotalaria juncea*, *Albizzia julibrissin*, *Hibiscus esculentus*, peas, sweet potato, spinach, and Burley and Gold Dollar tobacco likewise remained free from external symptoms of the disease [cf. *R.A.M.*, 22, p. 65].

The name of *F. oxysporum* f. [*F. bulbigenum* var.] *tracheiphilum*, previously applied to the agent of cowpea wilt [ibid., 22, p. 192], is provisionally retained, but the probable necessity of revision on the basis of fresh evidence is indicated.

The pathogen was carried in several lots of cowpea seed, from which it was not eliminated by treatment with sodium hypochlorite [ibid., 11, p. 220].

Leyendecker (P. J.). **Carrot blight caused by Alternaria dauci appears in New Mexico.**—*Plant Dis. Reptr*, 33, 11, p. 431, 1949. [Mimeographed.]

During 1949 bunching carrots (mainly Imperator, with a few scattered acres of Morse's Bunching), which have been grown as a commercial, irrigated crop in New

Mexico for over eight years, sustained the first major outbreak of blight (*Alternaria dauci*) [*R.A.M.*, 27, pp. 221, 555; 29, p. 88]. At Bluewater and Grants, the chief carrot-producing area of the State, 1,000 to 1,200 acres were damaged, and about 200 acres at Los Lumas, where the carrot acreage is being rapidly expanded. Infection was temporarily checked by aeroplane dusting with various copper fungicides.

Fry (P. R.). **Lettuce mosaic.**—*N.Z. J. Agric.*, 80, 2, p. 159, 4 figs., 1950.

Lettuce mosaic [*R.A.M.*, 28, p. 503] was first observed in New Zealand in 1946. Surveys of 37 commercial crops in Auckland, Palmerston North, Levin, the Hutt Valley, and Christchurch revealed that the incidence varied from a trace to 100 per cent., the average being 25 per cent. The control measures include the use of disease-free seed, destruction of infected seedlings, dipping seedlings in nicotine-soap solution (1 oz. nicotine sulphate plus 2½ oz. soft soap to 5 gals. water), roguing, weed eradication, and prompt destruction (by ploughing in) of unmarketable plants.

Wright (C. M.) & Yerkes (W. D.). **Observations on the over-wintering of the pathogen causing downy mildew of Spinach in the Walla-Walla area.**—*Plant Dis. Reptr*, 34, 1, p. 28, 1950. [Multilithed.]

During the past three years spinach downy mildew (*Peronospora farinosa*) [*P. effusa*: *R.A.M.*, 23, pp. 208, 423] has become so severe in Washington State that the growers consider it unprofitable to make two plantings a year and now rely on a single autumn crop. In the spring of 1949 fields were not cropped in the Walla-Walla area, and a subsequent survey indicated that with the exception of one small planting all volunteer spinach was winter-killed. From the 1949 autumn plantings it appears that the oospores, either in the soil or sown with the seed, serve as a source of primary inoculum in this area, some unknown factor regulating viability and germination. Further investigations are in progress.

Aycock (R.) & Hughes (M.). **Cucurbit disease in the Blackville area of South Carolina during 1949.**—*Plant Dis. Reptr*, 33, 11, pp. 425–428, 1949. [Mimeographed.]

During 1949 the worst epidemic of cucurbit downy mildew (*Pseudoperonospora cubensis*) [*R.A.M.*, 28, pp. 108, 153; 29, p. 204] since 1938 occurred in the Blackville area of South Carolina. Symptoms appeared on cucumbers on 30th May, a week to ten days earlier than usual, and about 19 days after the first report of the disease in the State. In dusted cantaloupe plots at the Edisto Experiment Station yield increases of up to 50 per cent. per acre were obtained, in spite of 5·5 in. of rain which fell on 15 days during the dusting period [cf. ibid., 28, p. 504]. Cantaloupe mosaic [loc. cit.], caused by an unidentified virus, was widely prevalent. In a few localities watermelons were seriously affected by anthracnose (*Colletotrichum lagenarium*) [ibid., 29, p. 74]. Wilt (*Fusarium oxysporum niveum*) [*F. bulbigenum* var. *niveum*: ibid., 28, p. 117] was present to some extent on watermelons over the whole area, and as growers will not accept the resistant varieties at present available the disease is likely to remain a major problem in watermelon production for some time.

Dezeeuw (D. J.) & Vaughn (J. R.). **An antibiotic of potential value in field control of Cucumber scab.**—*Plant Dis. Reptr*, 34, 1, pp. 7–8, 1950. [Multilithed.]

In an experiment carried out at Michigan Experiment Station cucumber plants inoculated with a spore suspension of *Cladosporium cucumerinum* [*R.A.M.*, 27, pp. 109, 111, 592; 28, p. 436] on 5th and 18th July, and 4th August, 1949, were sprayed on 7th, 13th, 19th, 29th July, 16th and 25th August, and 1st September with cycloheximide (actidione) [see above, p. 451] 10 p.p.m., Crag 658 [copper zinc chromate: loc. cit.] (2 lb. per 100 gals.), tribasic copper sulphate (3 lb. per 100 gals.),

dithane Z-78 (2 lb. per 100 gals.), zerlate (2 lb. per 100 gals.), or left unsprayed. The applications were made at 75 to 125 gals. per acre. The total percentages (for 12 pickings) of scabby fruits, which were all in the last five pickings, after these treatments were, respectively, 13·1, 14·6, 15·8, 16·3, 19·6, and 19·5. Further work is to be carried out.

Hewitt (W. B.) & Winkler (A. J.). **A court noué-like disease found in California Grape Vines.**—*Plant Dis. Reptr*, 34, 1, pp. 27–28, 1950. [Multilithed.]

During the spring of 1948 five-year-old Pinot Chardonnay vines on St. George (Rupestris) rootstock and also Cabernet and French Colombard vines in Santa Clara County, California, showed symptoms resembling those of court-noué [*R.A.M.*, 29, p. 348]. As the season advanced the new growth tended to become normal, and by September it was difficult to distinguish healthy from affected vines. In 1949 the same vines displayed similar but less severe symptoms.

Stations fédérales d'essais viticoles, arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1948. [Report for 1948 on the work of the Federal Viticultural, Arboricultural, and Agricultural Chemistry Stations at Lausanne and Pully.]—*Annu. agric. Suisse*, 50, 8–9, pp. 767–904, 17 figs., 7 graphs, 1949.

The section of this report dealing with physiology and plant protection (pp. 788–816) [cf. *R.A.M.*, 28, p. 323] contains the following items contributed by M. Staehelin and W. Wurgler. Bordeaux mixture again proved superior to all the other copper-containing fungicides tested for the control of vine downy mildew (*Plasmopara viticola*), reducing the incidence of infection from an average of 99·1 to 2·8 per cent. The toxic effects of Bordeaux mixture on the foliage may be minimized and yields increased by the substitution of copper Sandoz (copper oxide) in the first two applications, reserving Bordeaux for the post-floral treatments.

In several experiments to determine the relative efficiency in the control of apple scab (*Venturia inaequalis*) [ibid., 29, p. 416] of lime-sulphur plus copper, lime-sulphur alone, and five wettable sulphurs, the last-named were, in general, equal or superior to lime-sulphur for the purpose in view but not as good as the lime-sulphur–copper combination. The wettable sulphurs were less injurious than lime-sulphur to the plant tissues, except in the case of the hypersensitive Baron de Berlepsch, Cox's Orange, Melba, and Laxton's Superb varieties, to which they were equally toxic. An organic sulphur product is preferable in such cases. To cite some data from one orchard, the Franc-Roseau variety sprayed six times with lime-sulphur plus copper showed on 3rd September 12·1 per cent. leaf scab and on 20th October 21·7 per cent. fruit scab; wettable sulphur A 29·2 and 19, respectively; wettable sulphur B 35·6 and 31·9; and the untreated 77 and 89.

In continuation of the previous year's experiments on apple mildew (*Podosphaera leucotricha*) control, two pre- and three or four post-floral treatments were applied. At the inspections made between 9th and 29th June, the average percentages of infection on the control plots and those sprayed with lime-sulphur plus 0·8 or 0·6 per cent. iron sulphate, thiovit plus 0·1 per cent. iron sulphate, and ciba-Maag [ibid., 27, p. 428] were 65, 8·4, 13·7, and 29·6, respectively.

Two dormant applications of 1·2 per cent. copper oxide (Sandoz), on 13th December, 1947 and 10th March, 1948, proved almost equally effective with 2 per cent. Bordeaux mixture against shot hole of peach (*Clasterosporium carpophilum*) [ibid., 29, p. 265], reducing the average number of infected clusters per tree from 162 to 0·13 (Bordeaux 0).

The most destructive peach disease in the canton of Ticino is mildew (*Sphaerotheca pannosa* [var. *persicae*]), for which no reliable means of control has yet been

found. In experiments at Bellinzona the best results were obtained with 0·5 per cent. lime-sulphur plus 0·2 per cent. iron sulphate plus wetter.

An epiphytotic of *Gymnosporangium sabinae* on pears in allotments at Lausanne [ibid., 7, p. 250] was associated with the proximity of the alternate host, *Juniperus sabina*. On pear trees immediately contiguous to the source of infection 950 out of 1,000 leaves were rusted, the corresponding figures for distances of 50, 200, and 1,000 m. being 100, 20 to 30, and 2, respectively. Fungicidal treatments proved unavailing, so that eradication of the junipers is the only practicable control measure for the time being.

Lettuce downy mildew (*Bremia lactucae*) was observed attacking *Cynara cardunculus*. In severe cases the plants ceased to grow and desiccation ensued. Prophylactic applications of coprantol, an oxychloride, conferred satisfactory protection without staining the leaves.

The best control of onion smut (*Urocystis cepulae*), which has decimated young plantings of recent years, is obtained by treatment of the soil with 0·3 per cent. formalin [ibid., 24, p. 305] at a dosage of 250 ml. per m.

The application of 2,4-D to Gros Framoisé vines in the autumn of 1946, and to Chasselas in the following spring, resulted in the development of degenerative symptoms recalling those of court-noué [ibid., 29, p. 76].

Memoria 1945, 1946 y 1947. [Report for 1945, 1946, and 1947.]—*Publ. Estac. Fitopat. agríc. Coruña* 43, 108 pp., 27 figs., 1 graph, 1949.

This report [cf. *R.A.M.*, 27, p. 113] contains, besides information already noticed from other sources, the following items of interest. J. Rodriguez Sardiña obtained from cabbage six further isolations of the virus causing mosaic of stock [*Matthiola incana* var. *annua*] and cauliflower [ibid., 27, p. 114; cf. also ibid., 28, p. 262; and above, p. 449].

The same author observed a fairly widespread foliar virosis of a wild species of *Malva*, a matter of some concern in view of the potential transmissibility of the infective principle to the related cotton. The disease assumes two forms, one a highly conspicuous mosaic of angular, very irregular spots, and the other an equally well-defined and unmistakable chlorosis, involving all the veins. Very few of the experiments in transmission by means of the juice were successful, extraction being complicated by the excessive quantity of mucilage in the plants, which further tends to agglutinate the virus particles.

A. Garcia Orad made a study of ten potato plants of the Palogan variety from la Granja [Old Castille] with the following symptoms of virus infection: in plant (1) rugose mosaic with darkening of the veins; in (2) intervenal chlorosis; in (3) and (4) mild rugose mosaic; in (5) the same, but rather more marked; in (6) severe rugose mosaic, with extensive foliar crinkling and distortion; in (7) the same, with very small leaves; in (8) yellow mottling; and in (9) and (10) venal necrosis. On the basis of the results of inoculation tests on tobacco and other hosts it is concluded that the symptoms observed in potato plant (2) are not of virus origin; in (6) and (8) they are due to a virus (not X); and in (9) they are attributable to virus X, possibly in combination with Y. Intracellular inclusions were detected only in *Nicotiana alata* plants inoculated with juice of (9), in which X-bodies developed after four months. As regards potential aphid vectors, *Macrosiphum gei* [*M. solanifolii*] is the most prevalent species in the affected region, followed by *Aphis gossypii*, while *Myzus persicae* was not encountered.

The same author studied a tomato disease characterized by stunting, weakness, and marked vein-clearing. The inoculation of tobacco with juice from the infected tomato resulted in the development of common mosaic symptoms, accompanied by a reduction of the lamina of the lower leaves, only the midrib remaining in some cases. Tobacco and *N. alata* inoculated with juice from the infected tobacco plant

developed symptoms similar to the foregoing. From a comparative study of the tomato virus and that of tobacco mosaic the following conclusions are reached. The virus responsible for the tomato disease is in close agreement with tobacco mosaic [see above, p. 440]. The reduction of the leaf blade is influenced by light and temperature, being most conspicuous in the autumn and winter, especially in plants (even those inoculated with tobacco mosaic virus) in the poorly lighted portion of the greenhouse. The tomato virus has little resistance to heat, dilution, or ageing, being destroyed by a temperature below 75° C., by dilution at under 1 in 1,000, and less than six hours' exposure; it travels through the host much more rapidly than tobacco mosaic virus and is overcome by the superimposition of the latter.

F. Martínez Cordon carried out experiments to determine the effect of sodium, potassium, and ammonium bromides, which have been used in the therapy of human virus diseases, on tobacco mosaic virus in the White Burley variety.

Five photomicrographs of unstained mounts of fungi and virus inclusions are reproduced, taken with a Zeiss micropolychrome camera fitted with various colour filters. The objects can be discerned much more clearly than when stained by the usual methods.

Phytophthora (?) *hibernalis* [cf. ibid., 26, p. 216] developed in a humid atmosphere on oranges affected by a disease, very widespread in Galicia, involving discoloration of the skin, softening of the tissues, and premature dropping.

Among new records for the Station may be mentioned *Cladosporium condylemar* [*condylonema*] Passer., on cherry, causing premature defoliation and weakening the trees; *Oidium cynarae* on artichoke leaves [ibid., 12, p. 660]; *O. erysiphoides*, causing substantial damage to a number of plants, e.g., peas, clover, and tomato [cf. ibid., 24, p. 475]; *Phaeoisariopsis* [*Isariopsis*] *griseola* on leaves of bean [*Phaseolus vulgaris*: ibid., 25, p. 97]; *Ramularia betae* on beet; and *Taphrina sadebecki* [ibid., 28, p. 548] on alder.

In further trials by P. Urquijo Landaluze to determine the relative efficiency of several reduced copper formulae in the control of vine downy mildew [*Plasmopara viticola*: ibid., 22, p. 52], the best results were obtained with 1 per cent. copper sulphate, next in order coming 1 per cent. Bordeaux mixture. Copper oxide proved ineffectual at dosages below 0·5 per cent.

Annual Report of the Director, Dominion Experimental Farms in 1947.—78 pp., 16 figs., 1 map, 1949; **1948–49.**—88 pp., 11 figs., 1 map, 1950.

In the first of these reports it is stated that in work with spring wheat a new source of resistance to leaf [brown] rust [*Puccinia triticina*] has been discovered in the South American wheat Frontana. The Dominion Laboratory of Cereal Breeding has developed rust-resistant perennial wheats from the cross Chinese × (Chinese × *Agropyron elongatum*); annual types resistant to stem rust [*P. graminis*] and brown rust have been developed from Marquis × (Marquis × *A. elongatum*).

The winter wheat variety, Yogo [*R.A.M.*, 28, p. 443], is resistant to various races of bunt [*Tilletia caries* and *T. foetida*]. Cornell, licensed and introduced in 1947, is resistant to loose smut [*Ustilago tritici*], which has caused considerable losses in Dawson's Golden Chaff [ibid., 27, p. 554]. Ottawa 2619 A is moderately resistant to brown rust and resistant to stinking smut, but moderately susceptible to loose smut. The Roxton oat variety, produced at Macdonald College, Quebec, possesses considerable rust resistance. A new oat variety, 3003-F, developed by the Cereal Division, Central Experimental Farm, Ottawa, is resistant to root rot (*Helminthosporium victoriae*) and highly so to rusts [*Puccinia* spp.] and smuts [*Ustilago* spp.]. All available seed of this hybrid was increased in California during the winter of 1947–8. Success has been attained in breeding oats for resistance to race 8 of stem rust [ibid., 29, p. 142]. Two new oat varieties, Santa Fe

and Klein 69 B, originating in South America and resistant to all common races of crown rust [*P. coronata*] and *H. victoriae*, were introduced. Studies carried out in Ottawa gave results of value in locating parental material to be used in further breeding work against grey speck disease (manganese deficiency) [ibid., 26, p. 195]. Vantage barley, developed at the Dominion Experimental Farm, Brandon, Manitoba, is resistant to stem rust. In late seeded tests a new barley variety, Montcalm, produced by the Cereal Division at Ottawa and resistant to mildew [*Erysiphe graminis*: cf. ibid., 26, pp. 296, 386; 28, pp. 330, 519], gave the highest yields.

During 1947, of 1,300 strawberry seedlings grown at Agassiz in a field badly infested by red stele [red core] disease [*Phytophthora fragariae*: see below, pp. 461, 468], the hybrid British Sovereign × Oregon 1639 was the best, with 22 per cent. infection. At Morden seedlings from Burgundy × Valentine were outstanding in vigour, freedom from disease, productivity, and late blooming.

The new flue-cured tobacco variety Delcrest, formerly designated D 2007 [ibid., 27, p. 340], developed in the co-operative breeding programme at Delhi and Harrow, Ontario, was released in 1947. It possesses a slightly higher relative resistance to black root rot [*Thielaviopsis basicola*: see above, p. 437] than the standard commercial varieties. Three new Burley varieties, Harrow Velvet, Haronova, and Harmony maintained high resistance, while among dark varieties, strains 45035 (being processed at Harrow) and 47136 (at Ottawa) showed considerable relative resistance. In 1948 Delcrest was officially released for commercial production. In the same year Burley strain 37001 (Harrow Velvet × Green Briar) was outstanding for the fourth year in succession. It displayed substantial resistance to *T. basicola* and brown root rot [loc. cit.; ibid., 28, p. 440]. Kentucky 22 showed high resistance to *T. basicola* but was susceptible to brown root rot. Among dark tobaccos strain 5058 is moderately resistant to *T. basicola*. In the black root rot resistance trials eight strains of cigar-type tobacco equalled Havana 211 in yield and showed the quality characteristics of their respective recurrent parents.

In the second report it is stated that Redman wheat has been back-crossed three times to McMurachy × Exchange, a hybrid highly resistant to brown rust [ibid., 28, pp. 622, 623]. Most of the new derivatives tested in 1948 were distinctly more resistant to brown rust than Redman [ibid., 29, p. 291], Regent, or other commercial varieties; they displayed satisfactory resistance to stem rust and some excelled Redman and the best Redman selections in yield. Rescue wheat, developed at the Dominion Experimental Station, Swift Current, Saskatchewan, is resistant to stem rust. In tests conducted under the auspices of the Ontario Winter Wheat Improvement Committee, Cornell 595 ranked higher in yield than Dawson's Golden Chaff and maintained its resistance to loose smut. Almost all the new oat hybrids being tested are resistant to *H. victoriae*, and breeding programmes were altered to obtain combined resistance to this disease and the prevailing races of crown rust, particularly race 45. New stocks developed for breeding have a very desirable type of resistance to the rusts, smuts, and Victoria blight. In barley breeding work, 60 F_5 selections from Titan × Vantage remained free from rust and smut. Vantage was reported to be susceptible to leaf blotch (*Septoria passerinii*) [ibid., 29, p. 80].

In breeding plots at Ottawa 20 to 25 per cent. of the red clover plants are killed every year in spring or early summer by *Sclerotinia trifoliorum* [ibid., 26, p. 60; 28, p. 402]. Preliminary breeding work indicates that resistant varieties may be developed. Breeding for resistance to club root [*Plasmodiophora brassicae*: cf. ibid., 21, p. 317; 25, p. 483; 29, p. 350] in swedes at the Central Experimental Farm, Ottawa, and at the Dominion Experimental Farm, Nappan, Nova Scotia, is largely confined to hybridization of swedes with resistant varieties of turnips and of two resistant varieties of swedes, Danish Giant and Wilhelmsburger. New lines of greatly superior type and resistance will, it is expected, soon be available.

Pea strains with high resistance to *Ascochyta pisi* [ibid., 28, p. 439] have now

been obtained, though varying significantly in their reaction to different isolates. No evidence was obtained of any relationship between the reaction of a variety to *A. pisi* and its reaction to *A.* [*Mycosphaerella*] *pinodes* [ibid., 7, p. 611; 28, p. 433]. In the field, *A. pisi* has been more troublesome than *M. pinodes* or *A. pinodella* [ibid., 27, p. 591], but *M. pinodes* is also a severe threat; *Pisum jombardii* and *P. elatius* appear to show some resistance to *M. pinodes*.

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st March, 1947.—30 pp., 1949. [Received May, 1950.]

The following items in this report [cf. *R.A.M.*, 25, p. 541] are of phytopathological interest. The failure to increase banana production in the island following the resumption of export in December, 1945, is due to the fact that almost all the best banana land is infested with Panama disease (*Fusarium oxysporum* var. *cubense*) [loc. cit. and ibid., 26, p. 160] to an extent which makes growers hesitate to embark on expansion, while the added threat of leaf spot (*Mycosphaerella musicola*) [ibid., 26, p. 250; 29, pp. 105, 251], together with the lack of water for spraying in many parts, contribute substantially to the difficulties encountered. Leaf spot control, organized by the Banana Leaf Spot Control Committee, functions smoothly, although the failure of small growers to adopt regular spraying schedules results occasionally in serious breakdowns of control efficiency. Such a case occurred at St. James, where failure to observe in detail the spraying and sanitation programme in the early summer of 1946 led to an increase in the disease in October and to the need for increased frequency of spray cycles.

During the year, 385 [selected hybrid] seedlings were planted out to test their resistance to *F. oxysporum* var. *cubense*. The lower percentage of susceptible seedlings in recent tests may be due to climatic conditions or to a higher degree of resistance in F_2 seedlings which comprise the majority of those being tested at present. Disease resistance tests are now being conducted only on primary selections and a few inbred F_2 families. The behaviour of Gros Michel × Pisang Lilan seedlings is anomalous in that a small majority (56 out of 102) have proved susceptible. In all other families susceptibility is clearly recessive and the majority of seedlings prove immune.

Experiments indicate that replanting infected land with susceptible bananas after 15 to 20 years under sugar-cane or grass is unlikely to be an economic proposition due to the persistence of Panama disease.

The health of coco-nut palms in various parts of the Northern Division caused some anxiety, particularly on the heavy clay soils of St. Mary. The Coco-nut Industry Board agreed to finance a comprehensive experiment on 35 acres of standing palms in St. Mary for five years, to test their response to soil conservation measures, forking, and under-cultivating with a fodder grass, and treatment with manures. After six months the condition of the palms already suggests that cultivation may be the most important factor affecting their vigour.

Investigations on 'unknown disease' of coco-nuts [ibid., 29, p. 24] were confined to studies on incidence and spread and to attempts to determine the cause of the disease. The growth measurements of leaves and fruit, and mortality records recommended by [R.] Leach were maintained throughout the year. Nearly two years' growth measurements have now been recorded and should form useful data for any future Coco-nut Investigation Officer.

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st March, 1948.—23 pp., 1950.

In this report [cf. preceding abstract] it is stated that the continued spread of the 'unknown disease' of coco-nuts [loc. cit.] westwards along the Hanover coast of Jamaica and the manner of its advance show that it must be regarded as infectious.

No connexion was found between manganese content of the leaves and date of death; some palms with very high manganese values died early, while others, with a very low manganese content, are still alive.

The M.J. maize variety, planted on a field scale at Orange River, was promising in its early stages, but later failed as a result of mosaic [cf. ibid., 27, p. 9]. Limes at St. Ann were widely attacked by knot disease (*Sphaeropsis tumefaciens*) [cf. ibid., 27, p. 564] at altitudes up to 400 feet, though the disease was less prevalent at higher elevations; withertip (*Gloeosporium limetticola*) [ibid., 20, p. 153; 23, p. 387; 24, p. 7] was prevalent only where humid conditions persisted. Considerable losses were caused in tomato nurseries in South Manchester and South St. Elizabeth by *Cladosporium fulvum* [ibid., 17, p. 375; 19, p. 170]; heavy dews were largely responsible, and planting was too close. Serious damage in the field was invariably attributable to lack of spraying.

Sixty-first Annual Report of the Kentucky Agricultural Experiment Station for the year 1948.—80 pp., 1949.

In this report [cf. *R.A.M.*, 28, p. 327] it is stated that certified red clover Kentucky 215 yielded 2,715 lb. dry matter per acre at an average of 1·7 plants per sq. ft., Wisconsin, resistant to mildew [? *Erysiphe polygoni*: ibid., 18, p. 319; 28, p. 116] 418 lb. and 0·6 plants, and four lots of Kenland 2,913 to 3,407 lb. and 7 plants.

In an epidemic of black rust [*Puccinia graminis*] in Todd county the early winter wheats Redhart and Purcam in test plots escaped serious infection and gave 38 and 45·6 bush. per acre with 56 and 57 lb. per bush. test weights, respectively, whereas the figures for nine other varieties ranged from 18·1 to 27·4 bush. and 43 to 53·5 lb. At Lexington infection by leaf [brown] rust [*P. triticina*] was heavy on susceptible varieties. Several new strains which combine high yield, satisfactory straw strength and test weight, and resistance to black and brown rusts are being increased for quality and yield tests. Recommended wheat varieties are Vigo, suitable for any part of Kentucky, and moderately resistant to brown rust and loose smut [*Ustilago tritici*], but susceptible to black rust, and Redhart, which escapes serious damage from brown and black rusts because of its early maturity.

Several experimental strains of winter barley which outyielded all others in two localities show some resistance to mildew [*E. graminis*: ibid., 27, p. 15] and loose smut [*U. nuda*: loc. cit.], and are being tested in northern states for hardiness. Some new strains of Lee-Victoria × Fulwin autumn-sown oats combine winter hardiness, resistance to crown rust [*P. coronata*: ibid., 27, p. 64], and strong straw. Because of dry weather during the growing season, spring oats were not as severely affected by *Helminthosporium* [*victoriae*: ibid., 28, p. 327; 29, p. 151] as in the past two years; susceptible varieties from untreated seed were frequently killed in the seedling stage. Early varieties, such as Columbia, Mindo, and Andrew, continued to give slightly higher yields than varieties of average maturity, including Clinton and Benton. All these are resistant to *H. victoriae* [see above, p. 457], and all except Columbia show high resistance to the rusts [*P. graminis* and *P. coronata*].

Since breeding work for resistance to tobacco wildfire [*Pseudomonas tabacum*: ibid., 29, p. 232] was begun in 1946 the fourth back-cross generation of tobacco × *Nicotiana longiflora* (resistant) has been grown. In a few lines resistant plants have appeared in fairly high percentages, suggesting that crossing over has occasionally taken place between the *longiflora* chromosome and a *tabacum* chromosome; if this proves true, the development of resistant varieties of both dark and Burley tobaccos is assured. In tests on 47 *Nicotiana* species reaction to wildfire ranged from extreme susceptibility in *N. benavidesii* and *N. paniculata*, through moderate susceptibility, as in tobacco, to resistance, as in most plants of *N. longiflora*, *N. alata*, *N. plumbaginifolia*, *N. repanda*, *N. bonariensis* and *N. arentsii*. *N. glauca* is very resistant to [tobacco] streak virus [ibid., 28, p. 85; and above, p. 438]. The

reaction of the F_1 hybrid tobacco × *N. glauca* is intermediate; local lesions are fewer and develop more slowly than in tobacco, while systemic infection also develops less rapidly and seems to be less severe. The resistance of back-crosses with tobacco after chromosome doubling by colchicine, is hard to evaluate or interpret, and it appears that the resistance has not yet been transferred to tobacco.

Tobacco streak inoculum from infected *N. rustica* produced local lesions on 57 of 75 sweet clover [*Melilotus* spp.] plants inoculated by rubbing. They mostly consisted of yellow spots 1 to 2 mm. in diameter, often with a small dead centre, while small dead spots and rings were also present. Systemic infection developed first in the youngest leaf or leaves of the main shoot or lateral branches. Leaves formed subsequently were sometimes dwarfed, sometimes pinched, often with large yellow areas or numerous yellow specks, occasionally faintly mottled, and often with irregular margins.

Brown root rot [ibid., 27, p. 264; and above, p. 488] is worse in seasons when heavy rain follows setting of the crop. In 1948 drought occurred after setting and the disease did not appear.

Infection of peach foliage and fruit by *Bacterium* [*Xanthomonas*] *pruni* [ibid., 29, p. 218] was unusually prevalent. Varieties severely affected at Princeton substation were: Elberta, Sullivan, Early Elberta, Tena, Sunhigh, K-63, K-61, K-43 (Prairie Rambler), K-47 (Prairie Clipper), K-55, Golden Gem, and Afterglow.

Fairland and Temple strawberry plants resistant to red stele [red core: *Phytophthora fragariae*: ibid., 27, pp. 65, 511; 28, p. 580; 29, pp. 349, 458] were distributed for trial in three areas where the disease has been found. The Temple variety gave a satisfactory yield for its first crop.

Eight dark tobacco varieties, the best of previous selections made at the Western Kentucky substation, were grown in comparison with eight strains resistant to tobacco mosaic virus and one new strain resistant to mosaic and black root rot [*Thielaviopsis basicola*: ibid., 29, p. 124, and above, p. 458]; the yields in pounds per acre [cf. ibid., 28, p. 327] for strains of Mosaic-Resistant Brown Leaf Ky 153, Ky 151, and R 27–44 were 2,028, 1,819, and 1,697, respectively, for Brown Leaf 1,951, Little Crittenden 1,874, Mosaic-Resistant Little Crittenden 1,831, Little Orinoco 1,800, Mosaic-Resistant Little Orinoco 1,759, strains of Mosaic Resistant One Sucker, Ky 160, R 20-30-31-50-28-44, and Ky 161-1, 1,824, 1,728, and 1,714, R 15-'47 (resistant to mosaic and black root rot) 1,444, W Ky 2 1,855, W Ky 1 1,786, Ky 141 1,779, Madole 1,678, and Clarksville Broadleaf 1,650.

The French Damson plum variety has not yet been affected by black knot [*Dibotryon morbosum*: ibid., 27, p. 354; 29, p. 349], which was moderately severe on Blue Damson and rather serious on Shropshire.

Excellent control of apple scab [*Venturia inaequalis*] was given by lime-sulphur (2 gals. per 100) applied in the pre-pink and pink stages and followed by wettable sulphur and fermate in the calyx and first and second cover sprays.

Fang (C. T.), Allen (O. N.), Riker (A. J.), & Dickson (J. G.). **The pathogenic, physiological, and serological reactions of the form species of Xanthomonas translucens.**—*Phytopathology*, 40, 1, pp. 44–64, 1 fig., 1 diag., 1950.

This is a tabulated report of studies at the Wisconsin Agricultural Experiment Station on the comparative pathogenicity of 13 single-colony and single-cell cultures of *Xanthomonas translucens* from six hosts, viz., barley, wheat, rye, *Bromus inermis* [*R.A.M.*, 28, p. 18], *Agropyron repens*, and *Phleum pratense*, together with observations on some of its physiological and serological reactions. A culture of *X. holcicola* [ibid., 21, p. 517] from Sudan grass was used as a control. The organisms were grown on a modified form of a synthetic medium (No. 79) containing 5 gm. sucrose, and an improved form of single-cell technique was used for the separation of individual cells.

In greenhouse and field studies on the pathogenicity of the cultures two methods of inoculation [cf. ibid., 29, p. 356] were used, namely, (1) injection of a bacterial suspension from two-day-old nutrient dextrose agar cultures into the leaf whorl at the base of the shoot with a hypodermic needle, and (2) spraying the suspension over the intact leaf surface. The differential hosts included barley, wheat, rye, oats *P. pratense*, *B. inermis*, and *A. repens*. The resultant symptoms fell into three main types, characterized by translucence, necrosis, or chlorosis, with various intergradations. On this basis five formae speciales of the pathogen were distinguished, viz., *hordei* (barley), *undulosa* (wheat), *secalis* (rye), *cerealis* (*B. inermis*), and *phleipratensis* (timothy). Hagborg's f. sp. *cerealis* [ibid., 21, p. 447] is redescribed to include the organisms from *B. inermis* and *A. repens*. By combining f. spp. *undulosa* and *secalis*, these five forms can be referred to four serological types by the cross-agglutination and agglutinin absorption tests, f. spp. *hordei* and *phleipratensis* representing the two extremes, with *undulosa-secalis* and *cerealis* intermediate.

Thalmann (Liliana). **Formazione di aschi nei periteci di Erysiphe graminis in vitro, in presenza di vitamine, fitormoni ed estratti vegetali.** [The formation of asci in the perithecia of *Erysiphe graminis in vitro*, in the presence of vitamins, phytohormones, and plant extracts.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 8–9, 1950. [Mimeographed.]

When fragments of wheat leaves bearing perithecia of *Erysiphe graminis* were kept under various conditions at various temperatures only a few asci formed, their development showing no relation to the environmental conditions. When, however, pieces of infected leaves of wheat and wild grasses were placed in solutions of hortomone A (Roche), naphthalene-acetic acid, and vitamins B_1, B_2, and PP, at various concentrations, asci formation was constant and rapid, though no ascospores developed.

Kingsolver (C. H.). **Downy mildew on Barley in Missouri.**—*Plant Dis. Reptr*, 34, 1, pp. 29–30 figs., 1950. [Multilithed.]

Scattered barley plants in an increase plot of a selection from Kentucky 5× Missouri Early Beardless (B 400) in a low, wet area on the South-eastern Experimental Farm at Sikeston, Missouri, in June, 1949 developed infection by downy mildew (*Sclerospora macrospora*) [*R.A.M.*, 9, p. 370; cf. 29, p. 152], apparently the first record of the fungus on this host from Missouri and the Middle West.

Biraghi (A.). **L'influenza della temperatura invernale sulla intensità del disseccamento batterico del Granturco.** [The influence of winter temperature on the intensity of bacterial blight of Maize.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 1–3, 1950. [Mimeographed.]

After referring to Stevens' view that in the north-eastern United States maize bacterial wilt (*Xanthomonas stewarti*) is usually absent when the sum of the average temperatures for the previous December, January, and February is under 90° F. and is severe when this figure is over 100° [*R.A.M.*, 14, p. 160], and to Haenseler's suggestion that there may be a time-lag [ibid., 17, p. 105], the author states that neither view seems to apply to the disease as it occurs in Italy [ibid., 27, p. 70; 28, p. 282]. In four seasons (1945–49) the December–February temperature indices were well over 100° at both Udine and Bergamo but in both localities infection was very serious in 1946 and 1947, and negligible or absent in 1948 and 1949.

Biraghi (A.). **Le malattie del Mais nelle annate 1948–1949.** [Diseases of Maize in the years 1948–1949.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 6–7, 1950. [Mimeographed.]

During the summer of 1948 the weather in northern and central Italy was

exceptionally wet and cold. Maize wilt (*Xanthomonas stewarti*) [see preceding abstract] was slight, and in many areas in which the disease had previously caused heavy losses it was scarcely present at all. Infection occurred [in 1948] near Assisi, the first record from central Italy. In 1949 seedlings from Trentino developed the characteristic form of the disease, not commonly found in Italy [cf. *R.A.M.*, 27, p. 70].

The abundant rain of 1948 induced marked infection of maize by *Helminthosporium* sp. [ibid., 25, p. 492], which in some instances caused rapid wilting. In 1948, maize rust [*Puccinia sorghi*: loc. cit.] was widespread; the sori were frequently parasitized by *Darluca* sp.

Trebbi (T.). **Il nanismo del Mais in Provincia di Brescia nel 1949.** [Dwarfing of Maize in the Province of Brescia in 1949.]—*Notiz. Malatt. Piante, 1950,* 8, pp. 13–16, 1 pl., 1950. [Mimeographed.]

During 1949, maize in the province of Brescia was widely affected by 'dwarfing' [*R.A.M.*, 29, p. 299], losses in some cases being very heavy, especially among varieties of American origin. In the second half of July incidence in a planting of hybrids near Iseo was 90 per cent. though the local varieties were unaffected. The disease is present in all parts of the province, under all environmental and soil conditions. About ten plantations had 60 to 90 per cent. infection. In all the plantings which were clearly affected (about 15 per cent. of the total) the reduction in yield ranged from 30 to 50 per cent. Nearly all the remaining fields, which were sown late (May–June), suffered appreciable loss. The condition never appeared before the period of earthing-up. In two affected fields of American hybrids the plants appeared to recover after a retardation of about 40 days. All fields sown before 28th April or during the summer remained healthy or showed only a negligible amount of dwarfing; those sown after this date, and particularly those sown between 10th May and the beginning of June, developed the highest percentage of the disease. A rainy period began on 28th April. The only race developed by uncontrolled fertilization which was severely affected was Pfister, introduced a few years ago from America. Among European maize varieties, of the very few plants which developed infection, nearly all followed wheat.

Ciferri (R.). **Il 'nanismo epidemico' e la probabile presenza del 'nanismo ereditario' del Mais in Italia.** ['Epidemic dwarfing' and the probable presence of 'hereditary dwarfing' of Maize in Italy.]—*Notiz. Malatt. Piante, 1950,* 9, pp. 36–39, 1950. [Mimeographed.]

In 1936 a physiological disease of maize caused by asphyxiation of the roots was reported from Monticelli and the vicinity of Pavia, while in 1937 a report followed of a frondescence accompanied by sterility of the flowers on maize at Pavia, due to excessive drought. As maize dwarfing [see preceding abstract] was also reported in the same years, the author re-examined the material of the first two conditions. Neither would appear to be identical with the form of dwarfing attributed to a virus; they seem, rather, to be identical with genetic maize dwarf. This condition differs from the semi-dwarfing known as 'anther ear', though andromonoecism of the female inflorescences is common to both.

It is concluded that two forms of maize dwarf appear to be present in Italy, only one of which appears infective, or supposedly so. The form at present attributed to a virus should be known as 'epidemic dwarf' and the other as 'hereditary dwarf'. The symptoms of the two are tabulated.

Vasudeva (R. S.) & Seshadri Iyengar (M. R.). **Mode of transmission of the long smut of Jowar.**—*Curr. Sci.*, 19, 4, pp. 123–124, 1950.

In 1948, at the Indian Agricultural Research Institute, New Delhi, over 50

per cent. of jowar [sorghum] plants inoculated with spore suspensions of *Tolyposporium ehrenbergii* [*R.A.M.*, 29, p. 152] (by forcing a needle into the boot enclosing the young inflorescences) developed typical infection after two to three weeks, the number of sori produced in individual ears varying from one to 12. The investigation confirmed that long smut infection is air-borne [ibid., 25, p. 32] and that it takes place when the flowers are still enclosed or at the time when they emerge [ibid., 29, p. 152]. It is suggested that weed-grasses may be sources of infection, and cross-inoculation experiments are in progress.

Vasudeva (R. S.) & Seshadri Iyengar (M. R.). **Secondary infection in the Bajra smut disease caused by Tolyposporium penicillariae Bref.**—*Curr. Sci.*, 19, 4, p. 123, 1950.

Inoculations at the Agricultural Research Institute, New Delhi, of very young bajra [*Pennisetum typhoides*] ears (still enclosed in the sheath leaves) with fresh spores of *Tolyposporium penicillariae* [*R.A.M.*, 28, p. 55] resulted in very good infection. The spores germinated immediately, the incubation period being only about two weeks. Field observations of crops from the beginning of September to the middle of November indicated the occurrence of secondary infection.

Gayford (G. W.). **Orchard notes.**—*J. Dep. Agric. Vict.*, 48, 4, pp. 169–170, 1 fig., 1950.

After describing the symptoms and treatment for the control of *Septoria* spot of citrus [*S. citricola*: *R.A.M.*, 29, p. 22] and [black] pit [*Pseudomonas syringae*: ibid., 28, p. 453] in Victoria, the author suggests that lemon trees in the early stages of collar rot [*Phytophthora* spp.: loc. cit. and ibid., 23, p. 175] may be saved if all decayed bark is cut away, the main roots bared to ensure that they are undamaged, and wounds coated with Bordeaux paste.

Apricot trees in the Werribee irrigation district were recently affected by black heart (*Verticillium* [*dahliae*: ibid., 28, pp. 68, 406]). The disease may have been caused by infected tomatoes having been grown previously in the same soil. The affected limbs should be removed below the last sign of browning and the cut treated with Bordeaux paste (1½ lb. copper sulphate in ½ gal. water combined with 2 lb. slaked lime in ½ gal. water).

Baldacci (E.). **Caratteri colturali delle razze di Bakerophoma tracheiphila.** [Cultural characters of the races of *Bakerophoma tracheiphila*]—*Notiz. Malatt. Piante, 1950*, 9, pp. 27–32, 1 col. pl., 1 map, 1950. [Mimeographed.]

After referring to the existence of two races of *Bakerophoma* (*Deuterophoma*) *tracheiphila* reported by Petri [*R.A.M.*, 10, p. 181] on material from Greece and Palestine, and by himself and his collaborators, working on material from Palermo [ibid., 28, p. 214; see also *Ric. sci. Ricostruz.*, 17, 11, 1947], the author states that from monopycnidial isolations *in vivo* he readily obtained a chromogenic race (DRP), which produced pycnidia, and a non-chromogenic one (DP). Subcultures on agar with hyaline or hyaline-red mycelium and no pycnidia were obtained; this race is denoted R or the red-albino race. The cultures of the strains are depicted in colours with details of their cultural characters, and a sketch map is given showing the presumed spread of the fungus into the eastern and central parts of the Mediterranean basin from its supposed place of origin in central Asia [cf. C.M.I. map 155].

Knight (R. L.) & Hutchinson (J. B.). **The evolution of blackarm resistance in Cotton.**—*J. Genet.*, 50, 1, pp. 36–58, 1950.

After briefly touching on the epidemiology of cotton blackarm (*Xanthomonas malvacearum*) [*R.A.M.*, 29, pp. 153, 163, 211] and reviewing earlier work on the

genetics of resistance, the authors give a full account of resistance studies carried out at Shambat, Sudan, since 1947 [ibid., 27, p. 474]. This is followed by a discussion of the mode of action of resistance genes, the original focus of the disease and its spread on Asiatic cottons, its impact on cotton varieties in the New World, resistance in New World cottons acclimatized in Asia and Africa, the origin of the more important resistance genes, and their value.

India is the main centre of resistance. In the New World, resistance is found in Central America and in the *punctatum* cottons of the Bahamas, but only two resistant strains have been discovered in the main bulk of the commercial Uplands. In *hirsutum* cottons acclimatized in the Old World, marked resistance is common in the Uplands and *punctatum* varieties of India and Africa. The highest resistance recorded in New World cottons is found among the West African *punctatum* group.

The foundation of effective resistance has proved to be a major gene in all cottons tested. The value of minor genes alone is limited, but wherever there has been prolonged selection under epidemic attack the main gene has been fortified by lesser ones. Effective resistance can be built up only round a main gene.

KNIGHT (R. L.). **The genetics of blackarm resistance. VIII. Gossypium barbadense.** —*J. Genet.*, 50, 1, pp. 67–76, 1950.

Gossypium barbadense presents two forms of resistance to *Xanthomonas malvacearum* [*R.A.M.*, 28, p. 454 and see preceding abstract], a weak one due to leaf hardening, occurring in the Sea Island varieties, and a strong one due to the gene B_5 fortified by minor genes in the perennial variety Grenadines White Pollen. B_5 is variable in expression, but in general the homozygotes are more resistant than the heterozygotes. It is also additive in conjunction with B_1, B_2, B_3, and B_4, respectively.

FLOR (H. H.). **Abnormal cultures of Melampsora lini.**—*Phytopathology*, 40, 3, pp. 235–238, 1 fig., 1950.

In a study on the inheritance of pathogenicity in a cross between races 6 and 24 of flax rust (*Melampsora lini*) [*R.A.M.*, 26, p. 489] made at the North Dakota Agricultural Experiment Station in co-operation with the United States Department of Agriculture, abnormal uredial cultures were derived from abnormal aecidia. A few of the more vigorous abnormal cultures developed rudimentary teleutospores but in most cases none was formed. Some cultures lacked sufficient vigour to maintain themselves. The results of tests for virulence on the rust-differentiating varieties Akmolinsk and Bombay, of 20 cultures producing sufficient spores for pathogenicity tests, showed that the ratio of segregates differed significantly from the 9:3:3:1 ratio of normal cultures and suggest that an aecidium may develop from a pycnium spontaneously or by self-fertilization.

WILLIAMSON (C. E.). **Ethylene, a metabolic product of diseased or injured plants.**—*Phytopathology*, 40, 2, pp. 205–208, 2 figs., 1950.

This study was undertaken to determine whether diseased plant tissues produced ethylene and, if so, to correlate the symptoms of the disease with the quantity of ethylene produced. Production of the gas was measured by the response of etiolated Alaska pea seedlings, comprising a change of negative geotropism to diageotropism, increased growth in thickness, and reduced rate of growth in length, after being in the presence of the tissues for 72 hours at 25° C. Large quantities of ethylene were produced by rose leaves infected with *Diplocarpon rosae*, cherry leaves with *Coccomyces hiemalis*, and chrysanthemum flowers with *Ascochyta chrysanthemi* [*Mycosphaerella ligulicola*: *R.A.M.*, 29, p. 216]. Somewhat less was produced by chrysanthemum flowers infected with *Botrytis cinerea* and rose leaves

infected with *Cryptosporella umbrina* [ibid., 22, p. 24]. A still smaller quantity (though significantly larger than that produced by healthy tissue) was produced by rose leaves infected with *Sphaceloma rosarum*, oak leaves infected with *Taphrina coerulescens* [ibid., 8, p. 405], and carnation leaves infected with *Alternaria dianthi*. Ethylene production was stimulated by various types of injury. It was most abundant while the leaf was green, decreased as the leaf became yellow, and ceased when the leaf died and turned brown.

It is concluded that the injury produced by certain pathogenic fungi is sufficient to induce ethylene production, though other types of injury may cause it as well.

Miller (H. N.) & Magie (R. O.). **Control of Fusarium storage rot of Gladiolus corms.**—*Phytopathology*, 40, 2, pp. 209–212, 1950.

In Florida, *Gladiolus* corms suffer serious storage losses due to *Fusarium oxysporum* f. *gladioli* [*R.A.M.*, 28, p. 399; 29, p. 306]. During the 1948–9 season reduction in yield of the highly susceptible Picardy corms ranged from 30 to 90 per cent. Disinfection by new improved ceresan just before planting controlled only the rot in the field, whereas much of the infection resulting in storage rot occurs when the corms are cleaned. Treatments of corms from infested fields at the time of cleaning with a dip of $\frac{1}{2}$ per cent. fermate plus $\frac{3}{8}$ per cent. dow 9B, and with a 50 per cent. spergon dust were the most effective, resulting in 93·5 and 92·2 per cent. of healthy corms, respectively, compared with 48 per cent. for the untreated. There were no significant differences between the dust and dip treatments. The flower production indices for the two treatments were 381 and 380, respectively, compared with 136 for the control, the corresponding weights of corms produced being 165, 150, and 30 [gm.], and the number of corms 111, 105, and 27. The most effective control of *Fusarium* rot, both in storage and in the field, was a treatment at cleaning time with one of the materials listed above, followed by dipping at planting time in 2 per cent. spergon or $\frac{1}{4}$ per cent. new improved ceresan.

Johnson (F.), Allmendinger (D. F.), Miller (V. L.), & Gould (C. J.). **Leaf scorch of Gladiolus caused by atmospheric fluoric effluents.**—*Phytopathology*, 40, 3, pp. 239–246, 1 fig., 1950.

A hitherto undescribed disease, herein referred to as leaf scorch of gladiolus, has been observed in areas in western Washington where the atmosphere was polluted with fluorine compounds from alumina reduction factories. The field symptoms were reproduced by fumigation with hydrogen fluoride in a sealed room. Of 72 gladiolus varieties studied for their reactions to fluoric effluents and amount of foliage injury seven were resistant and 13 very susceptible, while the remainder were intermediate in their reaction. In general the resistant varieties contained more fluorine in the foliage than susceptible ones. The fluorine content of scorched plants from polluted areas was higher than unscorched plants grown in areas remote from atmospheric fluoric effluents.

Ciferri (R.). **L' 'arricciamento fogliare' del Pelargonio in Italia.** [Leaf curl of *Pelargonium* in Italy.]—*Notiz. Malatt. Piante, 1950*, 9, p. 11, 1950. [Mimeographed.]

During 1949 small ornamental plantings of *Pelargonium* in Italy showed characteristic symptoms of leaf curl [virus: *R.A.M.*, 12, p. 223; 20, p. 304; 28, p. 575, *et passim*]. *P. zonale* was apparently unaffected, but on another occasion in the same locality it developed the pathological variegation ascribed by Passalacqua to *Bacterium barkeri* [ibid., 13, p. 517], though the author considers this to be of virus origin. *Pelargonium* leaf curl has not previously been observed in Italy on an epidemic scale, as it was in 1949. Mosaic was not present.

Gilbert (J. C.), Mainland (G. B.), & Lohman (M. L.). **Heat treatments for diseased Orchid plants.**—*Bull. Pacif. Orchid Soc., Hawaii*, 8, 3, pp. 289–293, 1950.

In preliminary tests carried out in Hawaii 12 potted plants of *Dendrobium* and *Cattleya* orchids were experimentally infected with a species of *Phytophthora* [*R.A.M.*, 21, p. 202; 25, p. 481], tentatively considered a variant of *P. palmivora* or *P. parasitica*, and when maintained at 107° F. and a relative humidity of 90 per cent. for 24 hours five lost all symptoms of the disease and grew normally. At 116° or 120° in a saturated atmosphere for periods up to one hour 25 minutes *Dendrobium* and *Cattleya* all developed strong new leads. In a further test a single *Cattleya* plant with nine leads was divided into nine pieces, each with two or three pseudobulbs per lead; each lead was inoculated. When large necrotic areas developed at the inoculation site, four unpotted portions were exposed to vapour heat at 116° for 15 to 30 minutes. These and also unheated, inoculated plants were potted and placed in a high humidity room. The four treated plants continued growth and showed no further effects of fungal infection, though the untreated developed typical injury. Six weeks after treatment three of the untreated controls had been killed by the fungus and the leads of the remaining two were dead and their backbulbs dying.

Curteis (W. M.). **Sunflowers become payable crop.**—*Banana Bull., Sydney*, 13, 149, p. 8, 1949.

The most prevalent disease of sunflowers in Queensland and New South Wales, where the crop is being widely and remuneratively grown for oil production, is wilt (*Sclerotinia sclerotiorum*) [*R.A.M.*, 29, p. 289]. The only other pathogen of any consequence is rust (*Puccinia helianthi*) [ibid., 29, p. 217].

Carr (A. J. H.) & Davies (D. L. G.). **A technique for the selection of Red Clover seedlings resistant to the clover rot fungus, Sclerotinia trifoliorum Eriksson.**—*Nature, Lond.*, 165, 4208, p. 1023, 1950.

In the course of work on breeding red clover resistant to clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, 27, p. 283] at Aberystwyth, a method of artificial inoculation was devised. Moist sterilized bran was inoculated with mycelium from young, actively growing cultures, and after two weeks' growth was removed to shallow dishes, dried at 30° C. for 48 hours and powdered in a mortar. This inoculum may be stored at 3° to 4° C. for considerable periods without loss of viability. At the first trifoliate leaf stage clover seedlings were dusted with the inoculum and covered to ensure conditions of adequate humidity. The attack usually commences about the third day and spreads rapidly until at the end of a week all but a few seedlings are dead. Under these conditions the survival rate averages one per 1,000 seedlings inoculated, and these are transferred to larger pots for further testing when mature. No evidence is yet available on the capacity of mature plants developed from these seedlings to resist infection.

Beaumont (A.). **Leaf spots of Helleborus niger.**—*Gdnrs' Chron.*, Ser. 3, 128, 3313, p. 16, 2 figs., 1950.

The leaf spot of *Helleborus niger* caused by *Coniothyrium hellebori* [*R.A.M.*, 26, p. 246] is very prevalent in south-western England. It spreads very rapidly in wet weather, particularly in autumn and winter, but spraying with Bordeaux mixture has often given good results. Applications should begin in October and be repeated at monthly intervals until new growth ceases, except when the flower buds are expanding. At the end of the season any leaves still affected should be burnt.

Septoria helleborina has been recorded once in England, having been found by

the writer in north Devon in 1938; it is easily recognized by its thin, straight spores, measuring 10 to 20 by 2 μ.

Parker (K. G.) & Burkholder (W. H.). **Pseudomonas syringae van Hall on Apple and Pear in New York State.**—*Plant Dis. Reptr*, 34, 4, pp. 100–101, 1950. [Multilithed.]

In 1946 severe blossom blight was observed on Sheldon and Seckel pears in an orchard in Wayne County, New York State, a few miles south of Lake Ontario. By midsummer most of the blossoms had dropped, a considerable number of dead clusters were still attached to the spurs, and in some cases up to one-half of the spur tip was dead. The Bartlett variety appeared to be only moderately affected.

In 1947 the disease appeared in the same orchard but less severely, while severe blighting of fruit spurs on Wealthy apples was reported in an orchard in the same county. The apple orchard was not visited in 1948; in 1949, although the symptoms were relatively unimportant in both orchards, similar symptoms were observed in other apple and pear orchards as well.

From their appearance the symptoms were considered to be of bacterial origin. Culture experiments showed that the causal organism was not *Erwinia amylovora*. Other bacteria known to be pathogenic on pear blossoms are *B* [*acterium*] *barkeri* [see above, p. 466] in England and *Pseudomonas nectrophila* [*Ann. appl. Biol.*, 4, pp. 50–74, 1917] in South Africa. These organisms are closely related to *P. syringae* [*R.A.M.*, 15, p. 515] and all three might prove to be identical if comparative studies were made. Inoculations with 13 isolates on Red Kidney bean and Lima bean plants gave symptoms like those of *P. syringae* and from a study of their cultural characteristics it is concluded that the New York pathogen is *P. syringae*.

Mulder (D.). **Is kurkstip boriumgebrek?** [Is internal cork boron deficiency ?]—*Fruitteelt*, 40, 5, p. 92, 1950.

Particulars are given of some experiments in Holland which seem to point to a connexion between internal cork of apple and boron deficiency [*R.A.M.*, 25, p. 506 *et passim*]. In 1948 the following percentages of the disease were noted on Transparente de Croncels fruits sprayed with borax, the figures representing the means between the 0·75 and 1 per cent. concentrations: (1) treatments on 28th July and 15th and 30th August, 1·8; (2) first two dates, 2·6; (3) last two dates, 11; (4) first date, 4·5; (5) second date, 24; (6) third date 25; and (7) untreated 35. In another test on French Reinette sprayed on 7th and 20th July and 6th August, 1949, the percentages of internal cork in fruits on the treated and untreated trees were 21 and 67, respectively. Analyses of the boron content of the treated fruits indicate that a 0·75 per cent. concentration of borax is ample to prevent internal cork development. Promising results have also been obtained with soil treatments of 100 kg. borax per ha.

Scott (D. H.), Jeffers (W. J.), Darrow (G. M.), & Ink (D. P.). **Occurrence of strains of the Strawberry red stele fungus, Phytophthora fragariae Hickman, as shown by differential varietal response.**—*Phytopathology*, 40, 2, pp. 194–198, 1950.

In the winter of 1948–9, at Beltsville, Maryland, several strawberry varieties were grown in the greenhouse in soils infested with *Phytophthora fragariae* [*R.A.M.*, 28, p. 580; and above, p. 458] obtained from different sources. None of the plants grown in the control soil A (steamed potting soil) had any infection. Rather inconclusive results were obtained with the soil B (steamed potting soil inoculated with diseased plants from Oregon), probably due to insufficient inoculum, as 20 per cent. of the susceptible Blakemore were free from infection, but Pathfinder and Sparkle were susceptible,

whereas most varieties were resistant. Soils C (infested bench soil) originally from Maryland and D (taken fresh from the same plot as C) yielded almost identical responses. The varieties with resistance derived from Aberdeen [ibid., 27, p. 374] (Fairland, Pathfinder, Sparkle, and Temple) were susceptible, while those with resistance from Scottish parents [loc. cit.] (Md. 683 (Scotland BK 46 × Fairfax) and Md. 1972 derived from it) were highly resistant. In soil E (from a Maryland strawberry field) there was a complete reversal of varietal response; Aberdeen, Fairland, Pathfinder, Sparkle, and Temple were highly resistant or free from infection, while Md. 683 and Md. 1972 were susceptible.

The evidence indicates that there are at least two strains of *P. fragariae*, A, to which Aberdeen is resistant, and S to which the Scottish types are resistant. No variety is known to be resistant to both strains, and breeding for resistance will therefore be more difficult than anticipated.

Fischer (G. W.) & Johnson (F.). **Cane and leaf rust, Kuehneola uredinis (Link) Arth., of Blackberries in western Washington.**—*Phytopathology*, 40, 2, pp. 199–204, 2 figs., 1950.

For several years a cane and leaf rust of cultivated cutleaf Evergreen blackberry (*Rubus laciniatus*) caused by *Kuehneola uredinis* [*R.A.M.*, 27, p. 532] has been studied in western Washington. In 1947 and 1948 the disease became widespread, causing considerable commercial losses. During the autumn of 1948 it was found on the cutleaf Evergreen blackberry in every county in western Washington in a direct line from Sumas on the Canadian border to Vancouver in the south. In 1949 the disease reappeared in epiphytotic form. The fungus has not been reported from the western United States, except sparingly in the coastal regions of southern California. The rust appears in western Washington in late spring as large lemon-yellow uredosori on the bark of the fruiting canes and later attacks the leaves, resulting in 1948 in premature defoliation. Fruit infection in that year was severe enough to make it difficult to avoid picking infected berries. Teleutosori were not observed till late and the discovery of pycnia and aecidia in October and November, 1948 indicates that the teleutospores germinate the same season they are produced. The rust probably overwinters as latent uredesori or uredial mycelium in the canes. In comparative resistance tests the following varieties remained free from infection: Boysen Thorny, Boysen Thornless, Brainard [loc. cit.], Cascade, Eldorado, Himalaya, Logan Thorny, Logan Thornless, Lucretia, Nectar, Ore. No. 583, Ore. No. 616, Pacific, Young Thorny, and Young Thornless.

Big decline in incidence of bunchy top.—*Banana Bull., Sydney*, 13, 145, p. 11, 1949.

According to H. J. Cann of the New South Wales Department of Agriculture, only one banana plant out of every 2,000 planted in the State in 1949 was found to be infected by bunchy top [virus: *R.A.M.*, 26, p. 401]. In 1937 there was more than 12 times as much infection per acre as in 1949. Fifty highly trained inspectors are employed in the detection of the disease, and during the year ended June, 1949, their work extended over an area of 120,631 acres. During this period, in 8,000 acres of the Tweed River district, 30 diseased plants per 100 acres were found and destroyed, the corresponding figures for Brunswick River being 7,046 and 16, and for Richmond River 5,630 and 37. Paraffin is applied to the diseased plants immediately on detection to kill the aphid vector [*Pentalonia nigronervosa*].

Kamal (M.). **Leaf blight of Pandanus spp.**—*Curr. Sci.*, 19, 4, pp. 125–126, 1 fig., 1950.

During the rainy season of 1948, the author observed a leaf blight of *Pandanus odoratissimus* [*P. tectorius*] and *P. fascicularis* [*P. tectorius*] in the University and National Botanical Gardens, Lucknow, caused by *Alternaria tenuis* auct.

At first small, oval or elliptical, etiolated areas appeared on the leaves, and later elongated and became darker. Under high humidity and temperature the spots turned black, owing to the preponderance of conidia, and coalesced, often covering the whole leaf surface. Sometimes perforations occurred in the spots, causing premature defoliation and poor flowering of male plants. The fungus was cultured on several media, the optimum temperature being 25° C.

Inoculation tests proved the fungus to be a pathogen, although a weak one, for infection was induced only on wounded leaves. This accounts for the lower leaves being more diseased, as they are more vulnerable.

MARTIN (G.). **Une pourriture du collet du Papayer au Cameroun.** [A collar rot of Papaw in the Cameroons.]—*Rev. Mycologie*, 12, *Suppl. colon.* 2, pp. 34–37, 2 figs., 1947. [Received January, 1950].

Morphological and cultural studies have shown *Fusarium solani* var. *minus* (*Hypomyces haematococcus* var. *breviconus*) [*R.A.M.*, 29, p. 273] to be the cause of collar rot of papaw near Yaoundé in the Cameroons. This is believed to be the first record of the fungus parasitizing papaw in Africa.

TURRELL (F. M.). **A study of the physiological effects of elemental sulphur dust on Citrus fruits.**—*Plant Physiol.*, 25, 1, pp. 13–62, 6 figs., 3 graphs, 1950.

After pointing out that one of the chief drawbacks to the use of sulphur as a fungicide is its tendency to scorch leaves and fruit during hot weather, the author gives an exhaustive account of studies carried out at the University of California Citrus Experiment Station on the physiology of injury to citrus fruit by elemental sulphur dust. The object of the work was to provide a basis for the development of sulphur insecticides and fungicides less injurious in hot weather than those at present used [see next abstract].

In the humid coastal areas of California both fruit and foliage may be injured, though in the drier regions inland injury is usually confined to the fruit. The damage occurs only on parts exposed to direct sunlight. Leaf injury takes the form of a necrosis ranging from small spots to extensive areas, sometimes including most of the chlorenchyma. Injured yellow lemon fruits show small, white, translucent spots, the affected area often becoming yellowish-pink. In ripe navel oranges a green spot may appear in the injured part. In green lemon fruits destruction of the chlorophyll leaves small to large yellowish-pink to light red areas, occasionally surrounded by a small green ring which in turn is surrounded by a yellow one. In green navel oranges the centre of the injured area may be light green and surrounded by a pinkish-brown ring. After about two days, severely affected areas on ripe and green fruits become sunken, brown, and hard. The oil glands protrude from the collapsed and sunken tissues surrounding these areas. Injury may be superficial or involve the pulp.

The results showed that radioactive elemental sulphur dusted on to lemon fruits penetrated the peel to a depth of 240 μ when the fruit was incubated for six hours at 140° F. Citrus fruits dusted with elemental sulphur and incubated at 90° to 135° produced hydrogen sulphide and sulphur dioxide gases and other volatile constituents. More hydrogen sulphide is produced in late winter and early spring than at other times, correlating roughly with the glutathione content of the peel.

Sulphur-dusted fruits have higher percentages of sulphate in the peel and peel sap than undusted fruits. At the critical peel temperature range at which lemons are injured by elemental sulphur there is a decrease in pH of peel extracts with increase in temperature from 105° to 122°. Incubation at increasing temperatures increased loss of weight of dusted over undusted fruits in the critical temperature range, but at higher temperatures the relationship was reversed.

Elemental sulphur dust appears to lower the critical temperature at which citrus fruits are injured by absorption of sunlight. The principal factors influencing this temperature in the external environment are (*a*) sun radiation intensity, (*b*) air temperature, (*c*) air vapour density. Injury ensues when outgoing energy fails to balance incoming energy at a point below the critical temperature. Air temperature and vapour density regulate the rate of outgoing energy.

YARWOOD (C. E.) & JACOBSON (L.). **Selective absorption of sulphur-35 by fungus-infected leaves.**—*Nature, Lond.*, 165, 4207, pp. 973–974, 1 fig., 1950.

In experiments carried out at the University of California, Berkeley, bean [*Phaseolus vulgaris*] leaves infected with the uredial stage of rust (*Uromyces phaseoli*) [*U. appendiculatus*] or with powdery mildew (*Erysiphe polygoni*), and sunflower leaves infected with rust (*Puccinia helianthi*) were detached from greenhouse plants and exposed to the vapours from 50 ml. of 0·01 per cent. sodium sulphide (containing 5 to 8 microcuries of sulphur-35) at pH 8 in sealed jars for eight hours at about 22° C. The treatment was lethal to all the mycelia, but did not injure the host [cf. *R.A.M.*, 29, p. 419].

Radioautographs of bean leaves inoculated with rust four to 21 days before treatment showed greater uptake of tracer sulphur by infected than by non-infected areas of the same leaf or by healthy leaves. In one representative test with infections eight days old and uredial pustules measuring about 1·2 mm. in diameter, most lesions showed a centre of strong radiation of about 0·5 mm. in diameter, encircled by alternate zones of weaker and stronger radiation. Radioautographs of leaves inoculated four days prior to treatment showed the location of the pustules before they were visible. The radiation from mildewed and rusted areas was up to five times that of normal areas. The amount of absorbed sulphur necessary for destroying rust and mildew infections without injury to the host varied greatly, but was of the order to 1 to 3 μ gm. sulphur per sq. cm. of leaf area. A tenfold increase in dosage resulted in only a twofold increase in the amount absorbed.

CIFERRI (R.). **Potere anticrittogamico dell' esanitrodifenilamina e suo sinergismo coi sali di rame.** [The fungicidal power of hexanitrodiphenylamine and its synergism with copper salts.]—*Notiz. Malatt. Piante, 1950*, 9, pp. 40–43, 1950. [Mimeographed.]

Laboratory tests confirmed the fungicidal activity of ammonium hexanitrodiphenylamine [*R.A.M.*, 27, p. 407] against the spores of an *Alternaria* of the *A. tenuis* group, *Sclerotinia fructicola* [C.M.I. map no. 50], *Stemphylium sarciniforme*, *Fusicladium dendriticum* [*Venturia inaequalis*], *Clasterosporium carpophilum*, *Fusarium solani*, and *Plasmopara viticola*. Greenhouse tests on vines artificially infected with *P. viticola* demonstrated its anti-mildew efficiency and its synergism with copper sulphate.

Papers presented at the Pittsburgh symposium on the teaching of plant pathology.—*Plant Dis. Reptr*, 34, 4, pp. 102–117, 1950. [Multilithed.]

These five papers were presented in a symposium on the teaching of plant pathology, at the Fortieth Annual Meeting of the American Phytopathological Society, held at Pittsburgh on 6th December, 1948.

TOKIDA (J.). **Swollen-head disease of Sphacelaria and swollen-foot disease of Spongomorpha.** —*Bot. Mag., Tokyo*, 61, 721–726, pp. 113–116, 17 figs., 1948. [Japanese summary. Received May, 1950].

The 'swollen-head' disease of the alga *Sphacelaria subfusca* on the east coast of southern Saghalien, characterized by inflation of the terminal segments of some

main filaments of the young propagula, was found to be caused by *Olpidium sphacellarum* Kny [*Olpidiopsis sphacellarum* (Kny) Sparrow], a description of which is given.

Another species of (?) *Olpidium* was responsible for 'swollen-foot' of *Spongomorpha duriuscula*, one of the commonest seaweeds in southern Saghalien, in which the apical segments expand into an obovate form and are frequently occupied by spherical bodies of variable dimensions.

Miyabe (K.) & Tokida (J.). **Black-dots disease of Gloiopeltis furcata Post. et Rupr. caused by a new Ascomycetous fungus.**—*Bot. Mag., Tokyo*, 61, 721–726, pp. 116–118, 6 figs., 1948. [Japanese summary. Received May, 1950.]

Guignardia gloiopeltidis n.sp., which produces scattered black dots over the entire frond surface of the economically important red alga *Gloiopeltis furcata* in three localities of Japan, is characterized by globose, dark brown to black perithecia, 90 to 150 μ in diameter, and oblong to clavate, pedicellate asci, 52 to 80 by 12 to 16 μ, containing eight hyaline, oblong to obovate or subclavate ascospores, 14 to 20 by 4 to 5 μ.

Taylor (C. B.). **An improved method for the preparation of silica gel media for microbiological purposes.**—*J. gen. Microbiol.*, 4, 2, pp. 235–237, 1 pl., 1950.

An improved method for preparing silica gels is described [*R.A.M.*, 29, p. 165]. It involves the use of a column of base-exchange material 'soucol', making the gel from a silica sol, and removing the cations from sodium silicate by means of base-exchange material. Sols so made can be sterilized by heat and remain stable for some weeks. Bacteriological media can readily be prepared with such sols and the gelling time regulated by the concentration of sodium chloride used. The facility with which silica sol can be produced and its stability during storage and autoclaving suggest that it may prove useful for many purposes in the cultivation of micro-organisms.

A patent for the production of silica sols through carbonaceous base-exchange material has been filed in Britain by the National Aluminate Corporation of America.

Hildebrand (E. M.). **Techniques for the isolation of single micro-organisms. II.**—*Bot. Rev.*, 16, 4, pp. 181–207, 1950.

The author reviews and discusses with 101 references to the literature the developments since the publication of his earlier paper [*R.A.M.*, 18, p. 334] in techniques for the isolation of single micro-organisms, inoculation and aseptic culture of micro- and macro-organisms also being included. The topics dealt with comprise 'micrurgy' [ibid., 23, p. 493], pure culture by dilution, semi-mechanical, and mechanical methods, the Burch reflecting microscope, germ-free culture of animals, and single cell isolation by the Trexler agar-coverslip method.

Anchel (Marjorie), Hervey (Annette), & Robbins (W. J.). **Antibiotic substances from Basidiomycetes. VII. Clitocybe illudens.**—*Proc. nat. Acad. Sci., Wash.*, 36, 5, pp. 300–305, 1950.

In further studies in this series [*R.A.M.*, 29, p. 272] two active, antibacterial substances, illudin S and illudin M, were isolated in crystalline form from culture liquids of *Clitocybe illudens*. Illudin M inhibited *Memnoniella echinata* and *Penicillium notatum* at a concentration of 16 μg. per ml., *Chaetomium globosum* at 32, *Trichophyton mentagrophytes* at 64, *Myrothecium verrucaria* at 125, *Aspergillus niger* at 250, and *Gliomastix convoluta* at more than 250. Illudin S at 250 μg. per ml. did not inhibit the growth of these fungi.

Gottlieb (D.), Hassan (H. H.), & Linn (M. B.). **Actidione as a plant protectant.**—*Phytopathology*, 40, 2, pp. 218–219, 1950.

The antibiotic properties of actidione [*R.A.M.*, 28, p. 635; 29, pp. 373, 451] were tested by adding it at various concentrations to Blakeslee's medium, on which the test organisms were cultured. A value of 10 was assigned to the mycelium in the control flask, and the growth in other flasks was rated 0 to 10 by visual inspection. *Stemphylium sarciniforme* was completely inhibited by 10 p.p.m., *Glomerella cingulata* and *Rhizoctonia* [*Corticium*] *solani* by 50 p.p.m., *Pythium graminicola* and *Fusarium lycopersici* by 100 p.p.m., and *Sclerotinia fructicola* [cf. ibid., 28, p. 636] by 1,000 p.p.m.

The material was most injurious to tomato and bean [*Phaseolus vulgaris*] plants, killing all the leaves at 1,000 p.p.m.; about 50 per cent. of the leaf area became necrotic at 100 p.p.m., while at 10 and 1 p.p.m. small necrotic spots covered about 15 and 10 per cent. of the leaf, respectively. Geranium [*Pelargonium zonale*] leaves had approximately 33 per cent. of their leaf area burned at 1,000 p.p.m. and 10 per cent. at 100 p.p.m., with no evident injury at lower concentrations. Peach twigs were completely defoliated 10 days after the applications of the two higher concentrations, but no apparent injury was caused at the lower concentrations.

Abrams (E.). **Microbiological deterioration of cellulose during the first 72 hours of attack.**—*Text. Res. J.*, 20, 2, pp. 71–86, 2 figs., 10 graphs, 1950.

At the Institute of Textile Technology, Charlottesville, Virginia, a determination was made of the loss of tensile strength of 8-oz. cotton duck during the first 72 hours of incubation, using five cellulolytic fungi, viz., *Thielavia* sp., *Humicola* sp., *Stemphylium* sp., *Chaetomium globosum*, and *Myrothecium verrucaria* [*R.A.M.*, 28, p. 585]. At the end of this period the residual strength of the samples in the above-mentioned order, calculated as a percentage of the strength of the controls, was 55, 34, 89, 36, and 31, respectively.

A study of mildewed fibres in dilute alkali demonstrated the localized nature of cellulolytic mould attack and the production of alkali-soluble material in the areas. With the advance of infection the cellulose becomes soluble, first in decreasing concentrations of alkali and finally in water.

The following indirect methods were used for the identification of cellulose decomposition products: (*a*) study of the action of cellulolytic moulds on sugars and sugar derivatives; and (*b*) testing of cellulose derivatives. *C. globosum* was found to be capable of utilizing, especially in shake cultures, a wide variety of sugars, among them being *l*-arabinose, *d*-xylose, *d*-fructose, *d*-galactose, *d*-mannose, maltose, sucrose, *d*-lactose, gluconic acid, and inositol, in all of which mycelial growth was heavy to very heavy [loc. cit.]. The mould also throve on castor oil. Of the cellulose derivaties tested, cellobiose octacetate and glucose pentacetate stimulated the mould to luxuriant growth. Enzyme extracts of *C. globosum* digested degraded forms of cellulose but not native cotton fibres.

Ohashi (S.) & Nakabayashi (H.). **Fungicides for starch pastes.**—*J. agric. chem. Soc. Japan*, 23, pp. 107–110, 1949. [Japanese, with English summary. Abs. in *Chem. Abstr.*, 44, 8, p. 3650, 1950.]

Without the addition of antiseptics, the starch pastes used in the textile industries are liable to putrefaction, especially wheat flour, crude maize starch, and technical wheat starch. In tests on nine antiseptics mould growth in a paste containing 4 gm. sweet potato starch, 50 ml. water, and 0·4 gm. Turkey red oil was inhibited by sodium salts of *o*-chlorophenol, 2,4-dichlorophenol, and 2,4,6-trichlorophenol, and by 2-naphthol, phenol, and formalin, all at 0·02 gm. In a paste consisting of 20 per cent. wheat flour and 10 per cent. of a softening agent,

2,4,6-trichlorophenol (10 per cent.) was the best of the compounds. Zinc chloride prevented putrefaction to a certain extent.

Basu (S. N.) & Bose (R. G.). **Factors affecting the fruiting of Chaetomium species.** —*J. gen. Microbiol.*, 4, 2, pp. 132–140, 1950.

A study at the Indian Jute Mills Research Institute, Calcutta, of the factors affecting the production of perithecia by *Chaetomium cancroideum* (*108*), *C. ochraceum* (*109*), *C. cochliodes* (*110*), *C. dolichotrichum* (*111*), *C. funicola* (*112*), *C.* sp. (*115*), *C. elatum* (*116*), *C. elatum* (*116·1*), *C. globosum* (*79*), and *C. indicum* (*75*) [*R.A.M.*, 28, p. 24] showed that all except *79* and *75* fruited better at 22° [C.] than at 30°, though the colony growth of five strains was faster at 30°. Of the carbohydrates (at 3 per cent.) cellulose (Whatman filter paper no. 42), starch, and maltose gave the biggest sum totals for intensity of fruiting, and were the only carbohydrates that stimulated fruiting of all strains on agar. Sucrose and dextrin were fairly good carbon sources and stimulated maximum fruiting of three and four strains, respectively. On the whole fruiting was stimulated by low glucose. The evidence also showed that the agar favoured fruiting. The secondary influence of growth factors may have been responsible for the excellent results given by maltose. The polysaccharides were more active than the sugars in producing perithecia. Of the four sources of nitrogen tested peptone gave the best results, followed by asparagine and then by sodium nitrate; ammonium sulphate, generally a poor nitrogen source, was very good for a few strains, including *C. globosum*, and was the only nitrogen source that induced fruiting in *108*. The fruiting of some strains was stimulated on media without phosphorus and nitrogen, respectively, the effect being rather more marked in the absence of the former. The fruiting of strains *110*, *111*, *112*, *79*, and *75* was improved by extracts of jute and agar, the agar having relatively the weaker action.

Steinberg (R. A.). **Growth of fungi in synthetic nutrient solutions. II.**—*Bot. Rev.*, 16, 4, pp. 208–228, 1950.

In this paper the author reviews and discusses with 137 bibliographic references the work done, since his earlier publication [*R.A.M.*, 18, p. 813], on the nutritional requirements of fungi with respect to carbon and nitrogen compounds, mineral salts, and vitamins for growth and reproduction. Sections on mutation and pathogenicity are included.

Kleczkowski (A.) & Nixon (H. L.). **An electron-microscope study of Potato virus X in different states of aggregation.**—*J. gen. Microbiol.*, 4, 2, pp. 220–224, 2 pl., 1950.

Electron micrographs of potato virus X strain X^y from various hosts [*R.A.M.*, 26, p. 183; 27, p. 491; 29, p. 246] made at Rothamsted Experimental Station showed tenuous, rod-shaped particles of variable length about 10 mμ broad. Lightly shadowed rods in the direction of the shadow displayed a regular cross-banding at intervals of about 10 mμ. Attempts at purification caused the particles to form rope- and net-like structures. Hydrolysis by chymotrypsin gave products too small to be resolved, and the material left after most of a preparation had been hydrolyzed appeared similar to that in unincubated preparations.

Struckmeyer (B. Esther) & Berger (K. C.). **Histological structure of Potato stems and leaves as influenced by manganese toxicity.**—*Plant Physiol.*, 25, 1, pp. 114–119, 2 pl., 1950.

After referring to the prevalence of potato stem streak necrosis in acid soils in northern Wisconsin where the amount of manganese in the soil solution was high [*R.A.M.*, 27, p. 40] the authors describe an experiment in which Chippewa potatoes

grown in complete nutrient solutions containing 200·5 p.p.m. of manganese developed severe stunting with stem streak necrosis in the upper part of the stems. At 50·5 p.p.m. the leaves on the lower part of the plant were chlorotic and stem streak necrosis was apparent on stem and petiole. At 5·5 p.p.m. the plants were normal except for the lower extremity. The concentration of manganese for normal potato growth was 0·5 p.p.m.

Hoshino (Y.). **On the Potato wilt disease.**—*Ann. phytopath. Soc. Japan.*, 13, 3–4, pp. 3–6, 1949. [Japanese, with English summary.]

Fusarium wilt of potatoes is stated to be prevalent in certain districts of Hokkaido, Japan, where the crop has sustained severe damage from this source of recent years. The species concerned are *F. oxysporum* f. 1 [*R.A.M.*, 22, p. 220], a variety of *F. solani* [ibid., 19, p. 359], and *F. avenaceum* [loc. cit.], of which the two first were pathogenic (the second highly so) in inoculation experiments. On the other hand, the last-named appeared to cause decay of stored potatoes only and was not involved in the field wilting. Culture filtrates were toxic to potato cuttings and caused wilting.

Matuo (T.). **On the effect of potassium-deficiency in the soil upon the occurrence of 'helminthosporiose' of Rice plant.**—*Ann. phytopath. Soc. Japan*, 13, 1–2, pp. 10–13, 1948. [Japanese, with English summary. Received May, 1950.]

In order to determine the relation between the potassium content of the soil and the severity of helminthosporiosis [*Ophiobolus miyabeanus*] of rice [*R.A.M.*, 19, p. 272], inoculation experiments were performed on seedlings planted in three series of water cultures, using Kasugai's solution, two being supplied with the element at 10 or 40 mg. per l. while the third received no additional nutriment. The fungus was also inoculated into the leaves of adult plants. The results showed that with solutions or soil in which the nitrogen and phosphorus levels were held constant, the severity of the disease decreased with a rise in the potassium level. However, the adverse effect of the deficiency appeared to be negligible after the close of the growing season.

It would seem that the pathogenicity of conidia produced on rice plants growing in solutions containing little or no potassium is actually stronger, judged by the numbers of lesions per unit leaf area resulting from inoculations in a moist chamber at 28° C., than that of those developing on adequately nourished plants.

Nisikado (Y.) & Nakayama (T.). **The influence of soil temperature on the expression of abnormal overgrowth of plants caused by Gibberella fujikuroi.**—*Ann. phytopath. Soc. Japan*, 13, 1–2, pp. 31–34, 1 diag., 1948. [Japanese, with English summary. Received May, 1950.]

In experiments at the Ōhara Institute for Agricultural Research, [Kurashiki, Okayama], to determine the influence of soil temperature on the 'bakanae' (elongation) disease of rice (*Gibberella fujikuroi*) [*R.A.M.*, 18, p. 707], artificially infected seedlings of rice, maize, and wheat were grown in pots maintained at constant temperatures of 22°, 25°, 28°, 31°, 34°, 37°, and 40° C. Three distinct strains of the fungus, causing varying degrees of elongation, were used as inoculum.

The maximum degree of elongation in the three species of inoculated plants occurred at 31°, 31°, and 28°, respectively, representing the optima for the growth of the uninoculated controls.

Yoshii (H.). **Studies on Cephalothecium as a means of the artificial immunization of agricultural crops.**—*Ann. phytopath. Soc. Japan*, 13, 3–4, pp. 37–40, 1 fig., 1949. [Japanese, with English summary.]

The filtrate from a two-months-old culture of a species of *Cephalothecium* in

Tochinai's nutrient solution [*R.A.M.*, 20, p. 275] completely inhibited the germination of rice blast (*Piricularia oryzae*) conidia at a dilution of 1:32. A few conidia germinated and formed appressoria at 1:64, but even at 1:128 the retardation in their development was remarkable. Neither the pH (7) nor the osmotic pressure (0·4 to 0·5 mol.) of the filtrate being inhibitory, its toxicity to *P. oryzae* is presumably attributable to a metabolic product of the *Cephalothecium*. Two days' immersion of rice seedling roots in dilutions of the filtrate from 1:15 to 1:240 did not impair their growth, but it evidently reduced susceptibility to blast, the number of leaf spots on the treated plants being substantially lower than on the controls.

Barbier (G.), Trocmé (S.), & Chabannes (J.). **Nouvelles recherches sur la chlorose des cultures en terrain d'épandage.** [Further researches on the chlorosis of crops on sewage-farm soil.]—*C. R. Acad. Agric. Fr.*, 36, 5, pp. 179–181, 1950.

Studies in 1949 showed that the general cause of chlorosis of vegetables grown on sewage-farm land to the north-west of Paris is manganese deficiency. Peas, potatoes, beans [*Phaseolus vulgaris*], and leeks were completely cured in less than a week by spraying the leaves with a 0·2 per cent. solution of manganese sulphate. Affected, treated plants in some cases grew better than neighbouring, unaffected, untreated ones; for example, affected [untreated], healthy [untreated], and affected, treated leeks, averaged, respectively, 117, 127, and 152 [gm.] per plant, the corresponding figures for beans being 36, 59, and 68 [gm.]. Analysis of dry material showed that in 1948 affected leeks had 9 p.p.m. manganese as against 15 p.p.m. for healthy ones, the corresponding figures for 1949 being 12 and 16; for spinach (1948) the figures were 23 and 31, and for beans (1949) 12 and 31. Attempts to incorporate manganese salts in the soil failed to reduce the chlorosis, and the treatment recommended is to spray or dust the leaves when the symptoms appear (or before) with manganese sulphate at the rate of 10 to 25 kg. per h. per application.

Van Hoof (H. A.). **A new species of Colletotrichum (Fungi imperfecti).**—*Bull. bot. Gdns, Buitenz.* (formerly *Bull. Jard. bot. Buitenz.*), Ser. III, 18, 4, pp. 473–478, 3 figs., 1950.

Colletotrichum derridis n.sp. produces on young *Derris elliptica* leaves in Java and Celebes, particularly on cuttings in nursery beds, dark reddish-brown spots, 1 to 20 mm. in diameter. The necrotic tissue often ruptures or falls out. The lesions do not expand with the growth of the leaf, which consequently becomes wavy. Necrotic spots, up to 15 by 2 to 4 mm., appear just below the growing point of the young shoots and on the petiole. Not infrequently they secrete a kind of gum.

The sporodochia are 20 to 60 (usually 30 to 50) μ in diameter. The subhyaline, 3 to 5-septate conidiophores measure 25 to 50 by 3 to 5 μ and give rise to hyaline, continuous or rarely uniseptate, elliptical conidia, generally tapering at one extremity, 10 to 21 (mostly 15) by 4 to 6·5 (5) μ. Conidia of the same dimensions are also formed at the apex of the greyish- to blackish-brown, 1- to 7-septate setae, which measure 20 to 110 (60) by 4 to 6·5 (5) μ. The fungus grows well on Thaxter's and other agar media, producing a mycelium which gradually changes from white to vetiver green, later dark ivy green, and finally to deep olive grey. Cylindrical or elliptical, often uniseptate conidia, 8 to 29 by 3 to 8 μ, are formed in groups of three to four.

No sporodochia were produced on sterilized leaves or stalks, and they were only once observed in an old culture.

The clones of the Ngawi (Javanese) group are the most susceptible to infection by *C. derridis*, while Wulung, Putih, Kotari (Saraw creeping), and Pantu show increasing resistance (in ascending order). *D. malaccensis* is seldom attacked and

D. timorensis appears to be immune. The leaf spot is more destructive in the humid regions of West Java than in the east of the island.

Copper-containing fungicides have given satisfactory control of the disease in nursery beds.

PARRIS (G. K.). **The Helminthosporia that attack Sugar Cane.**—*Phytopathology*, 40, 1, pp. 90–103, 6 figs., 1950.

Isolates from eye spots of Napier grass (*Pennisetum purpureum*) and sugar-cane in Florida and Hawaii and lemon grass (*Cymbopogon citratus*) in Florida, as well as from brown stripe of sugar-cane in Florida and Hawaii, yielded *Helminthosporium sacchari* [*R.A.M.*, 21, p. 258]. This species has not hitherto been associated with brown stripe, which was described by Drechsler as due to *H. stenospilum* [ibid., 7, p. 402]. Conidial dimensions and septation are not reliable criteria for the separation of the two species, nor can growth on 1 per cent. sucrose or maize meal agars at 27° to 28° C. be used for this purpose. The outstanding difference between *H. sacchari* and *H. stenospilum* is the thicker conidial wall of the latter. Another distinguishing feature is the single nucleus in the young conidiophore of *H. sacchari* as compared with the two in the corresponding structure of *H. stenospilum*. The vegetative hyphae of both species contain one, two (the most common number), or up to six nuclei per cell.

H. rostratum [ibid., 26, p. 337] was occasionally isolated from brown stripe lesions on sugar-cane (with *H. sacchari*) and from those of eye spot on *C. citratus*, both from Florida. A single nucleus is present in the young conidiophore of this species, which has been regarded as a saprophyte.

CHONA (B. L.) & HINGORANI (M. K.). **Mutation in Colletotrichum falcatum Went, the causal organism of Sugar-cane red rot.**—*Phytopathology*, 40, 3, pp. 221–227, 1950.

In comparative studies on isolates of *Colletotrichum falcatum* [*Physalospora tucumanensis*: *R.A.M.*, 21, p. 162], the agent of sugar-cane red rot, made at the Indian Agricultural Research Institute, New Delhi, the light-coloured isolates 29 and 78 mutated frequently on a rich medium such as Richards's agar, but the dark-coloured isolate 3 and the mutants 29D and 78D remained stable. The frequency of mutation increased with the age of the culture. Mutants 29D and 78D produced dark-coloured mycelium and sporulated scantily. The spores of mutant 29D measured 20·3 by 4·92 μ while those of 29 averaged 27·1 by 4·99 μ.

In field inoculation tests made during 1943, the mutants were less virulent than the parent isolates on the cane varieties Co. 213, 299, 313, 331, 356, 419, and 421, but on Co. 223 and 312 they had greater virulence than the parents. These results were borne out in preliminary laboratory tests.

PATEL (M. K.), KAMAT (M. N.), & PADHYE (Y. A.). **A new record of Puccinia on Sugarcane in Bombay.**—*Curr. Sci.*, 19, 4, pp. 121–122, 1 fig., 1950.

During September and October, 1949, the sugar-cane variety Co. 475 in the Deccan canal tracts, Bombay, suffered serious losses (up to 50 per cent.) from an apparently new rust, for which the name *Puccinia sacchari* [without a Latin diagnosis] is proposed. Other varieties were not affected. While the general characters and description of the spores are similar to those described by Butler for *P. kuehnii* (Fungi and diseases in plants, 1918), the teleutospores, the first record of this state on *Saccharum officinarum*, are much larger (32 to 85·5 by 16·2 to 37·1 μ) than those found on *S. spontaneum* and occur much more frequently. The uredospores measure 32·2 to 62·6 by 21·7 to 41·7 μ. In inoculation experiments the fungus readily infected Co. 475. This variety is also highly susceptible to smut (*Ustilago scitaminea*) [*R.A.M.*, 28, pp. 55, 161].

HUGHES (C. G.). **The production and testing of Sugar-cane seedlings.**—*Tech. Commun. Bur. Sug. Exp. Stas Qd, 1949*, 2, pp. 17–69, 10 figs., 2 maps, 1949.

On pp. 67–8 of this survey of sugar-cane seedling production in Queensland it is stated that seedlings undergo selection and propagation for about nine years, during which time any susceptibility to red stripe and top rot (*Xanthomonas rubrilineans*) [*R.A.M.*, 28, p. 244], ring spot (*Leptosphaeria sacchari*) [loc. cit.], eye spot (*Helminthosporium sacchari*), pokkah boeng (*Gibberella moniliforme*) [*G. fujikuroi*: ibid., 9, p. 340], leaf burn, cold chlorosis, root rots [unspecified], rust [*Puccinia kuehnii*: ibid., 2, p. 580; and preceding abstract], and freckles should become apparent under the conditions of natural infection existing in the area.

Diseases which were once of major importance and may still occur at the Experiment Stations include sugar-cane mosaic [ibid., 28, p. 243], Fiji disease [ibid., 29, p. 202], gumming (*X. vasculorum*) [ibid., 28, p. 196], leaf scald (*X. albilineans*), downy mildew (*Sclerospora sacchari*), and chlorotic streak. Special trials are run annually to test the reactions of new seedlings to these diseases. Most new canes are tested for resistance to mosaic in view of the possible development of a serious killing strain of the disease. Leaf scald is still a problem in the northern mill areas, and promising varieties are often barred from commercial use because of their susceptibility to this disease.

There is a further group of diseases for which satisfactory disease trials have not yet been developed in Queensland and which cannot be relied upon to cause natural infection during the propagation period. They include red rot (*Physalospora tucumanensis*) [ibid., 28, p. 197], rind disease (*Pleocyta sacchari*), and pineapple disease (*Ceratostomella paradoxa*). These are normally regarded as minor diseases but may cause serious losses to susceptible canes under certain conditions. Susceptibility sometimes remains unsuspected during all the early stages of selection and multiplication.

ADSUAR (J.). **On the physical properties of Sugar-cane mosaic virus.**—*Phytopathology*, 40, 2, pp. 214–216, 1950.

In his experiments on the physical properties of sugar-cane mosaic virus the author used mosaic-infected leaves of the variety BH 10/12, which yielded a highly infectious liquid. The longevity of the virus was found to be less than seven hours at room temperature (82° F.), the dilution end point 1 in 1,000 [cf. *R.A.M.*, 15, p. 398], and thermal inactivation at 55° C. It failed to pass Coors filter cylinder P_2.

WOLF (F. A.). **Notes on Venezuelan fungi.**—*Lloydia*, 12, 4, pp. 208–219, 1 map, 1949.

Notes are given on a collection of 103 species of fungi, mostly plant pathogens, from Venezuela, including 14 Phycomycetes, 12 Ascomycetes, 3 Ustilaginales, 13 Uredinales, 20 Hymenomycetes, and 41 Fungi Imperfecti [cf. *R.A.M.*, 14, p. 397; 21, pp. 324, 359; 29, p. 356]. Crop diseases are usually destructive in Venezuela, the weather predisposing the plants to infection. Certain pathogens, which are of minor importance in the south-eastern United States, produce epiphytotics in Venezuela. Of the total area (1,043,900 sq. km.) the portion under cultivation does not greatly exceed 1 per cent.

Coffee grown at elevations of 1,500 m. or more may be free from *Omphalia flavida* [ibid., 21, p. 324; 27, p. 132], *Corticium koleroga* [ibid., 14, p. 397; 29, p. 26], and *Cercospora coffeicola* [ibid., 21, p. 324; 26, pp. 105, 198], though these organisms are abundantly present in the lowlands. The leaf spots produced on coffee and other plants by *O. flavida* are luminous, as was noted by Ernst (1876), who called the disease 'candelilla' or 'little candle'.

Sooty moulds (Perisporiaceae) are abundant and widespread. Powdery mildews are rare, the conidial stage being collected on only four hosts, vine, roses, periwinkle [*Vinca rosea*], and *Sclerocarpus coffeicola* (flor amarilla). *Mycosphaerella areola* [ibid., 11, p. 512; 16, p. 838; 28, p. 563] everywhere causes severe premature defoliation of cotton. The disease is favoured by rain, but if the harvest is completed by the end of the rainy season, cotton may again flower and produce a dry-season crop which remains unaffected.

In areas flooded by rains or where irrigation is inadequate beans, cowpeas, soybeans, eggplants, peppers [*Capsicum annuum*], cotton, and tobacco are subject to root rot (*Macrophomina phaseoli*); as tobacco approaches maturity many plants may be killed by the disease. Diseases caused by species of *Cercospora* are very prevalent during the dry season on wild and cultivated plants. Sesame may be severely attacked by *C. sesami* [ibid., 24, p. 388; 26, p. 129], stems, leaves, and capsules being affected. Seedlings of Burley tobacco develop copious spotting by *C. nicotianae* [ibid., 28, pp. 209, 312] under conditions indicating that infection is seed-borne. *Mycosphaerella musicola* [ibid., 24, p. 388] is universally present on different kinds of bananas, and no evidence was found of any specific or varietal differences in susceptibility.

In general the native or criollo varieties of tobacco appear to be less subject to [unspecified] root rots and leaf spots than the Virginia and Burley types. The native maize varieties appear to be more resistant to drought and [unspecified] root rots than those imported from the United States.

Data in a recent report by Ciccarone on an epiphytotic of potato blight (*Phytophthora infestans*) in the Aragua Valley show that periods occur at night when temperature and humidity favour zoospore germination and infection. In the same area *P.* [*parasitica* var.] *nicotianae* [ibid., 28, pp. 326, 493] may cause serious losses to tobacco in seed-beds and in the field unless resistant varieties are planted.

Commonly encountered virus diseases, each of which causes grave losses, include sugar-cane mosaic, tobacco mosaic [ibid., 21, p. 324] and leaf curl [C.M.I. map no. 147], tomato leaf curl, yuca [cassava] mosaic [C.M.I. map no. 184], and top necrosis of papaw.

Cladosporium fulvum occurs on field-grown tomatoes [C.M.I. map no. 77].

Bonaventura (G.) & Camposano (Anna). **Micromiceti del M. Fumaiolo (Appenino Tosco-Romagnolo).** [Microfungi of Mount Fumaiolo (Etruscan-Roman Apennines).]—*Nuovo G. bot. ital.*, N.S., 56, 3, pp. 419–424, 1949. [English summary.]

This is an annotated list of parasitic fungi found in August, 1946, and September, 1948, on wild and cultivated plants growing on Mount Fumaiolo (Etruscan-Roman Apennines) and in the vicinity.

Bernaux (P.). **Observations sur quelques champignons parasites nouveaux ou peu connus de France.** [Observations on some parasitic fungi new or little known in France.]—*Rev. Path. vég.*, 28, 3, pp. 141–149, 1 pl., 1949.

The annotated list of fungi collected in 1948 in Haute-Savoie and the Mediterranean region of France includes *Urocystis tritici* on wheat (introduced on seed), found at Montpellier, and not before recorded from France [C.M.I. map no. 80], *Cylindrosporium salviifolii* n.sp. on *Cistus salviifolius*, *Pestalotia quercicola* [*R.A.M.*, 29, p. 64] on oak, and *Septogloeum nerii* n.sp. on oleander. *C. salviifolii* formed round, reddish-violet spots 1 to 3 mm. in diameter on the leaves, and the hyaline conidia measured 40 to 73 by 1·5 to 2 μ. *S. nerii* formed round, confluent leaf spots with a white centre, and a brown border with concentric zones, white at the centre to brown at the edge. The conidia measured 25 to 39 (27 to 33) by 3 to 4 μ.

Cummins (G. B.). **The genus Scopella of the Uredinales.**—*Bull. Torrey bot. Cl.*, 77, 3, pp. 204–213, 3 figs., 1950.

Descriptions are given and a key presented for the identification of 13 species of the genus *Scopella*, which occur in tropical countries. They include *S. sapotae* on *Achras zapota* [*R.A.M.*, 23, p. 42], *S. gentilis* on *Mimusops hexandra*, *S. palaquii* n. comb. on *Palaquium* sp., *S. cryptostegiae* on *Cryptostegia madagascariensis*, and one new species and two new combinations.

Cooke (W. B.). **Recent systems of Polypore classification.**—*Lloydia*, 12, 4, pp. 220–228, 1949.

The author critically reviews the systems of classification of the Polyporaceae by Pilát (Atlas des Champignons de l'Europe, 1936–1942, Vol. 3), Imazeki (Genera of the Polyporaceae of Nippon, 1943) and Cunningham [*R.A.M.*, 29, p. 122]. He finds none of them completely acceptable. Pilát's system is the most useful, because of the large amount of information given on each species treated, but it presents some workers with problems of interpretation, especially in generic limits, valid generic names, and the lumping of certain generic and specific groups, though other workers will find a solution to many of these problems in it. None of the three is altogether applicable in its present form to areas outside the region for which it is intended.

Fulton (R. W.). **Cross protection tests with Cucumber viruses 3 and 4 and Tobacco mosaic virus.**—*Phytopathology*, 40, 2, pp. 219–220, 1950.

Experiments were carried out to determine whether previous infection of cucumber plants with cucumber virus 3 or 4 [cucumber green-mottle mosaic virus and a strain of it, respectively,] could prevent infection by tobacco mosaic virus [*R.A.M.*, 29, p. 231]. In most tests the KC strain of tobacco mosaic virus [loc. cit.] was used. Cucumber cotyledons were inoculated with the cucumber viruses, and after four to six days with the tobacco mosaic virus. Approximately the same numbers of local lesions appeared on these cotyledons as on cotyledons which had not been inoculated with the cucumber viruses. In other tests cucumber leaves systemically infected with either cucumber virus were inoculated with tobacco mosaic virus. Six to eight days later these leaves were ground and after several successive transfers on cucumbers systemically infected with cucumber virus 3 or 4, tobacco mosaic was readily demonstrable by inoculation of the tobacco × *Nicotiana glutinosa* hybrid. Tobacco mosaic virus was found to multiply in the presence of cucumber virus 4. The trials failed to demonstrate any protective effect of the cucumber viruses against tobacco mosaic virus.

Ryjkoff (V. L.) & Gorodskaya (Mme O. S.). О формах фосфора в листьях здорового, мозаичного и голодающего Табака. [On the forms of phosphorus in healthy, mosaic-infected and starving Tobacco leaves.]—*C. R. Acad. Sci. U.R.S.S.*, N.S., 70, 1, pp. 105–108, 1950.

In experiments carried out at the U.S.S.R. Institute of Sciences, Moscow, the phosphorus content of Samsun tobacco leaves [*R.A.M.*, 23, p. 82] was determined colorimetrically by means of a photometer. There was a sharp increase of mineral phosphorus in starved leaves (kept in a desiccator) at the expense of both the acid-soluble organic phosphorus and the nucleoprotein fraction, including ribose nucleic acid. Mosaic infection of growing leaves and the accumulation of the virus nucleoprotein did not bring about an increase of phosphorus. Alkaline extracts from infected plants, in spite of the accumulation of the virus nucleoprotein and increased nitrogen, had less phosphorus than extracts from healthy plants.